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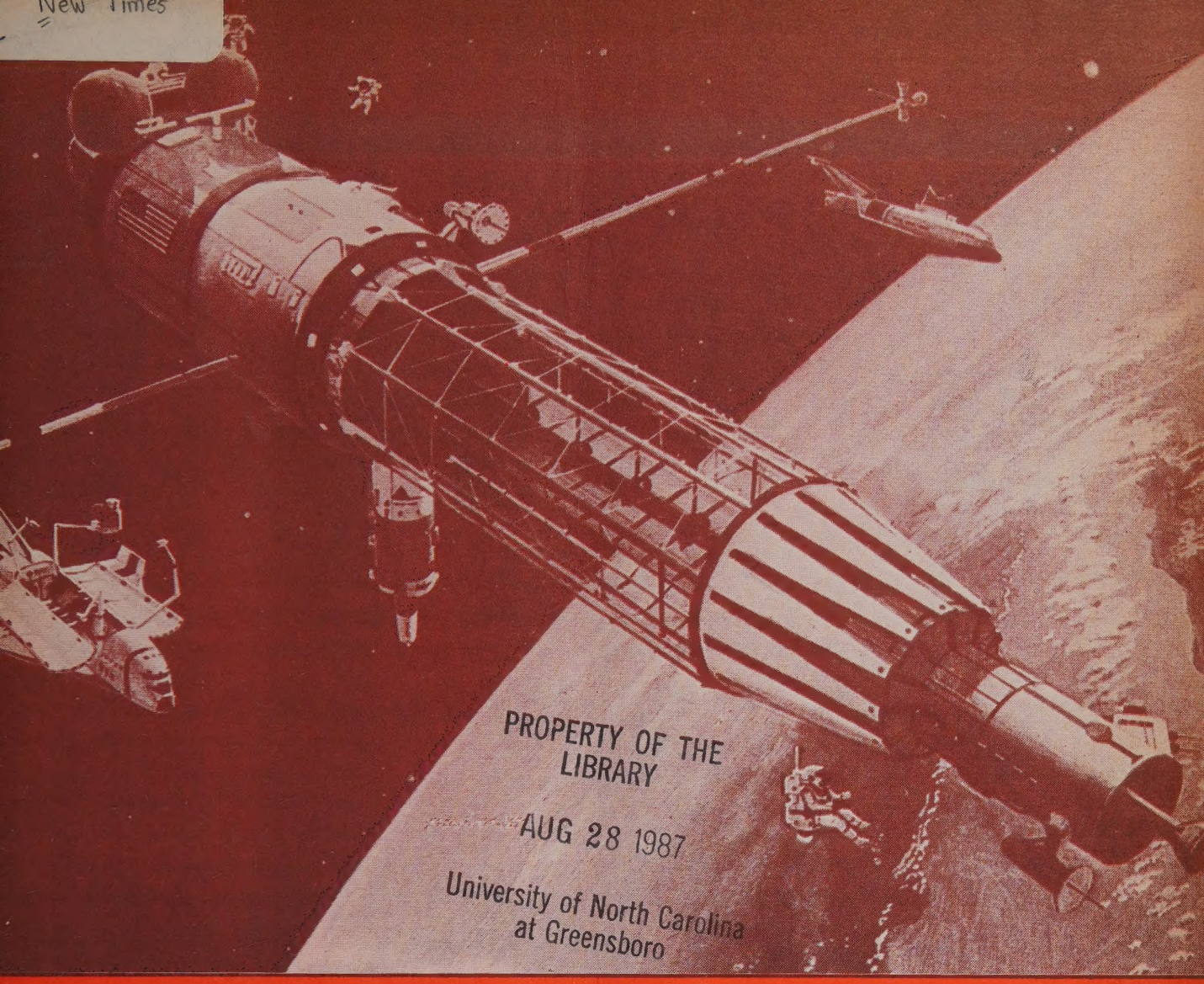

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SDI: DANGERS, ILLUSIONS, ALTERNATIVE

NEW TIMES

SPECIAL
SUPPLEMENT

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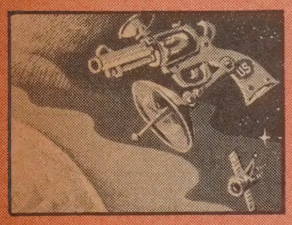

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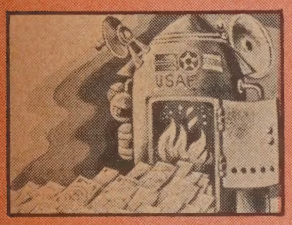

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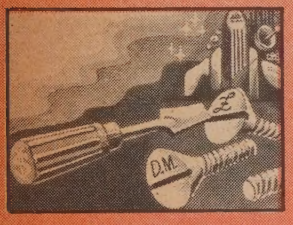

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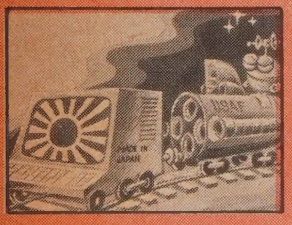

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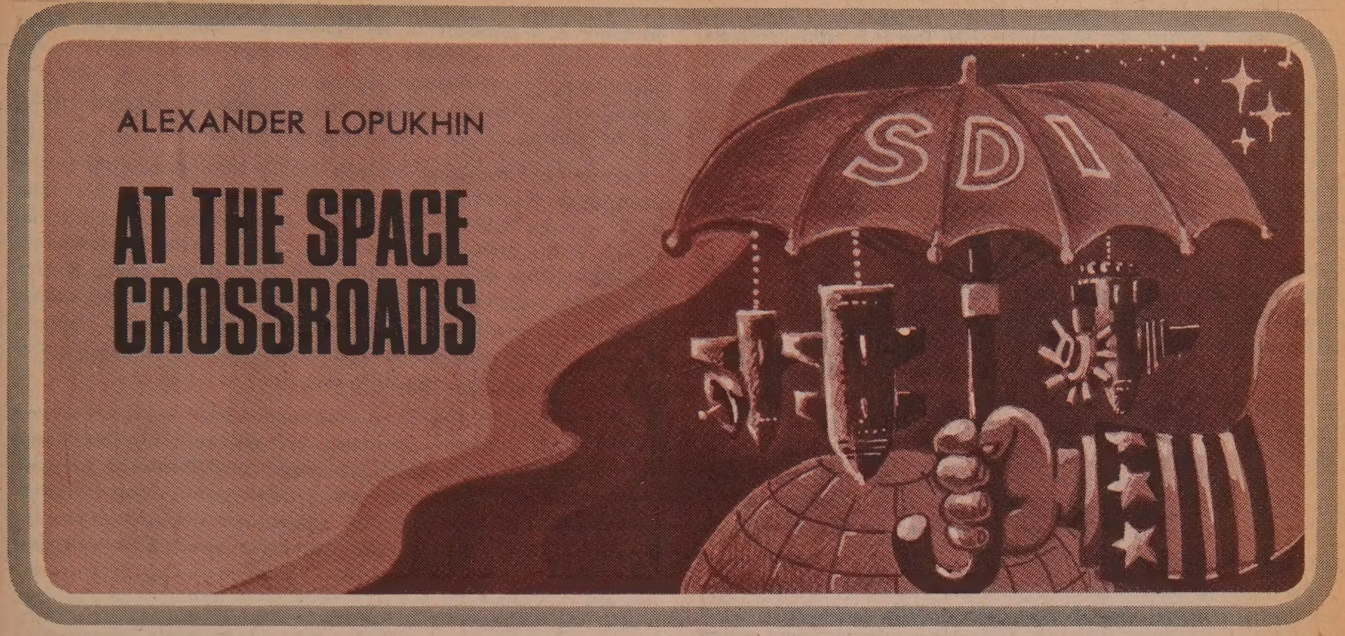
AT THE SPACE CROSSROADS



Four years ago the U.S. President had suddenly a wonderful dream. In his televised address to the nation on March 23, 1983, he surprised even many in his own team when he spoke of defensive weapons for the first time: what, he wondered, if the United States could intercept and destroy strategic ballistic missiles before they reached its own soil and that of its allies. He then urged the American scientific community to create "the means of rendering nuclear weapons impotent and obsolete." That was how the wide-ranging research programme later named the Strategic Defence Initiative (SDI) saw the light of day.

To be sure, many Americans who are tired of fearing mutually assured destruction liked his promise that SDI would exclude the possibility of a likely nuclear attack on them. They enjoyed watching commercials on TV at the time, showing incoming enemy missiles rebound from a fairy-tale astrodrome covering the entire capitalist world. Senator Edward Kennedy's definition of SDI as the "star wars" programme, after the popular U.S. sci-fi film trilogy, caught on. The White House was at first uneasy about the name, as it jarred with its propaganda effort to portray SDI as a peace-enhancing project. But it soon found comfort in the fact that "star wars" are perceived after all as remote and hence not dangerous. They bring to mind the intriguing picture of a battlefield hundreds of miles away in outer space and filled with robots and unmanned probes shooting at each other with exotic weapons. If unexpected, the SDI idea did not come entirely out of the blue. It was born of the Americans' fear of a nuclear Armageddon. By 1983 the U.S. administration had come to face an anti-nuclear movement of unprecedented proportions. By condemning nuclear arms as immoral, U.S. Catholic bishops set the stage for even more widespread public action for a freeze. People in America were also deeply concerned by Ronald Reagan's bellicose remarks about an "empire of evil" and his calls for a "crusade" against communism. In these conditions it was hard to hope that plans for new offensive nuclear arms would proceed unhindered. A way out was needed. It was found in SDI.

From the outset the programme was used as a moral pretext for a new spiral in the arms race. Every effort was made to stress its "defensive" nature and find new and seductive metaphors for it, such as an "impenetrable shield," a "gas mask" and an "insurance policy." Many people not really conversant with technology or politics were and continue to be deluded by such ploys.

A prominent role in engendering SDI was also played by the military-industrial complex which needed a large-scale programme to produce fundamentally new arms, so as to open up another gold mine and continue to work it for the next several decades. The arms manufacturers' calculations were simple and cynical: the race in offensive weapons would touch off a race in defensive weapons that would, in turn, lead to an even more feverish race in offensive arms. This is why Reagan's speech of March 23, 1983, did not come as a surprise to the leading companies of the military-industrial complex.

The "star wars" idea is also supported by the belief of many Americans in tough technological muscle. Some people tolerate SDI because they consider it an inevitable product of technological progress. Others believe it is a "technological bonanza" and a means of coming out on top. Still others hope it will help leave the Soviet Union behind, impoverished after having been forced into massive spending.

Unilateral superiority over the U.S.S.R. is the goal concealed behind the glib talk about the "star wars" programme's "defensive" nature. U.S. Secretary of Defence Caspar Weinberger was explicit: "If the U.S. could get a system that would be effective and that would render the Soviet armaments ineffective, the U.S. would return to the situation where it was the only country with nuclear weapons."

The SDI idea has been stripped of its innocent-looking wrapper by the conclusions drawn by the London-based International Institute for Strategic Studies in its annual report for 1984-85. It warned that if a strategic defensive system was practicable, it would detract from stability rather than reinforce it. It also added that if at the transitional stage either side came to possess strategic defensive systems that the other did not have, the risk of a first-strike strategy being used would become even more real.

This view is shared by many American experts. Robert Bowman, Chairman of the Institute for Space and Security Studies, believes, for example, that the only real opportunity for employing "star wars" weaponry is as an aggressor's protection against missiles surviving its own first strike. There is no more justice, therefore, in billing SDI as a "defensive system" than in giving the MX missile the soubriquet "peace-keeper."

Apart from pursuing military-strategic objectives, Washington would also like to use SDI to restore order in the ranks of its allies, enlist them in a new and major joint effort and

strengthen accord in the Western camp. The U.S. administration makes no bones about admitting its plans also to apply SDI as a means of bringing pressure to bear on the Soviet Union at arms control talks.

But it has gradually become obvious that the President's dream is illusory. SDI-related debates in the U.S. are no longer about the extent to which it is workable but about the extent to which it is unmanageable. American scientists who have studied SDI either in groups or individually are virtually unanimous in saying that a perfect space shield is impossible in principle, even if the Soviet Union does not adopt countermeasures, which is hardly likely.

The absolute majority of specialists at the U.S. National Academy of Sciences take the view that although the SDI programme is unfeasible, it is dangerous because current and future attempts to implement it will only serve to fuel the arms race. Scientists at the Massachusetts Institute of Technology are convinced that SDI is perhaps the only case in U.S. history where national policy would be based on an idea that does not have any technological foundation.

The issue of the survivability of space-based weapons has not been discussed in advance either. SDI supporters in the United States hate to be reminded of one circumstance which is far from negligible, namely that "star wars" weapons, even if they are created, will be impotent against strategic bombers, cruise missiles and submarine-launched missiles fired to travel on flat trajectories.

Last but not least, the projected system will do more than just provide a shield. Most experts, the French newspaper Le Monde Diplomatique has reported, believe that any high-energy weapons could equally serve both defensive and offensive purposes. Should they be developed, space weapons will also be able to destroy ground targets, such as military equipment, oil storages, crops, cause enormous fires and kill people. "For certain ground targets, it is the best offensive weapon in a panoply of technologies," commented Dr Peter Zimmerman, an associate at the Carnegie Endowment for International Peace. Reagan himself said on March 23, 1983: "If paired with offensive systems, they [defensive weapons—**A.L.**] can be viewed as fostering an aggressive policy."

Former U.S. Secretary of State Henry Kissinger wrote in the newspaper Newsday that reading President Reagan's "star wars" speech had not left him in raptures. He explained that as one of the architects of the ABM treaty, he had instinctively objected to the idea of rewriting that accord. Moreover, Kissinger added, the 100 per cent reliable population protection promised by the President was a mirage: even with a defence that was 90 per cent effective, enough weapons would still slip through to cause unacceptable damage.

The President's dream will not materialize even if the system's kill rate is almost a fantastic 99.9 per cent. But this dream has proved tenacious. Moreover, some $8,000 million have already been spent on investigating the hypnotic idea of building a "Maginot line" in outer space, and nobody knows for sure how much more money will be needed. Some experts speak of trillions of dollars.

The fact is that there is still no single concept of "star wars." The President continues to believe in a completely impregnable anti-missile "shield." Former U.S. Secretary of Defence Robert McNamara talks about "star wars-I." The arguments over this interpretation of SDI can mostly be reduced to how many decades—three or five—it will take to build a more or less dependable space shield. One fundamental question being asked is whether a shield against nuclear weapons that is not completely failsafe is expedient at all. Those answering it in the affirmative believe, in McNamara's words, in "star wars-II," or a partial defence. Also called "porous" or "cost-efficient," it bears little resemblance to what Reagan promised four years ago.

Even Reagan's most faithful advisers on technical problems, the Los Angeles Times has written, hedged and looked uncomfortable when asked if they could really bring the Americans' fear of Soviet nuclear weapons to nought, as promised by the President in his more reckless statements. Many Western experts acknowledge that a shield that is not 100 per cent effective can only give a boost to the race in offensive nuclear weapons, by triggering off "another arms spiral of countermeasures and counter-countermeasures." Dr Carl Sagan of Cornell University maintains that a leaky shield is worse than no

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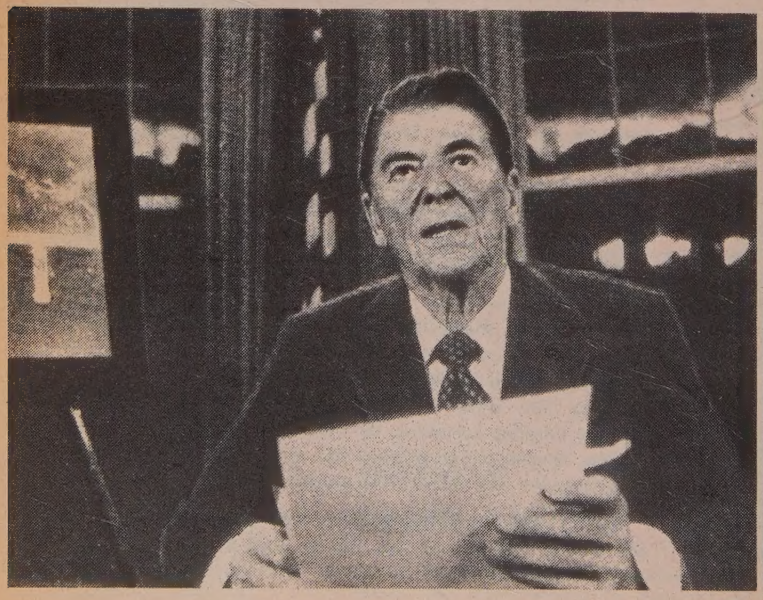
President Ronald Reagan on March 23, 1983 called on the scientific community to give the U.S. the means of rendering nuclear weapons impotent and obsolete. The physicist Edward Teller, one of the "fathers" of SDI, was much more cynical and frank about it. The story that SDI was intended for eliminating nuclear weapons on earth, he said in June 1985, had been put about for domestic consumption in the U.S. so as to deal a blow to the anti-war movement and make it accept SDI.



shield at all, as it can create a false sense of security and provoke the very event it is intended to prevent.

To cover up the replacement of the SDI dream with a surrogate, the U.S. administration has begun to speak of the prospect of a phased deployment of "star wars" weapons. They continue to talk stubbornly about advances in research and the technical possibility of deploying the first stratum of an SDI system as early as 1993 and 1994. It is to consist of hundreds of space battle stations in near-earth orbit, which, it is claimed, could fire thousands of miniature homing missiles capable of destroying ballistic missiles due to kinetic energy.

Contrary to Weinberger's upbeat statements, the project will cost an estimated $60 to $100 billion and be merely 16 per cent effective, according to two congressional aides who reached that conclusion recently after interviewing more than 60 scientists, engineers, managers and military experts involved in the "star wars" programme. It has become known from a report of the Senate staff that funds are nonetheless being gradually shifted from exotic projects to the "prosaic" weaponry needed for the first phase of SDI. The desire to fire people's imagination as soon as possible by deploying the system is explained, Washington observers believe, by purely political considerations rather than technical or even military ones.

SDI deployment plans, both current and long-term, are, however, greatly hindered by the fact that the testing and deployment of "star wars" weapons are banned by the ABM treaty of unlimited duration signed and ratified by the U.S.S.R. and the United States. It binds the hands of those itching to begin testing space arms. This is why they have started talking about a "broad interpretation" of the treaty that would enable the Pentagon to legalize the future testing of weapons under the "star wars-II" programme. The tests are likewise needed for more than just military or technical reasons, for the advocates of "star wars" in Congress are demanding a visual demonstration of SDI's viability. Otherwise, they warn, without thousands of billions of dollars in cash injections it will be stillborn at the laboratory stage.

SDI has so far remained a research programme that does not go beyond the laboratory and consequently beyond the limits of the sole possible interpretation of the ABM treaty. The Reagan administration's desire to adopt a "broad interpretation," so as to propel SDI from the laboratory to the development phase, has drawn a storm of protest both in Washington and West European capitals. Senator Sam Nunn, Chairman of the Senate Armed Services Committee, has warned Reagan that attempts to alter the meaning of the ABM treaty could provoke a "constitutional crisis."

In March 1987 six former Secretaries of Defence—Robert McNamara, Clark Clifford, Melvin Laird, Elliot Richardson, James Schlesinger and Harold Brown—sent a letter to Reagan, Weinberger, Secretary of State George Shultz and leading Congressmen, urging them to abide by the ABM treaty and renounce the "broad interpretation" of it. The letter emphasized that the treaty was a good point of departure for talks on significant cuts in strategic offensive arms.

Why does the idea of SDI continue to draw material and ideological support, despite the large number of people opposed to it in the United States? This question has largely been answered by a press release issued by a public organization calling itself the Council on Economic Priorities (CEP). According to its estimates, some 93 per cent of SDI deals in the fiscal 1985-86 year were awarded to contractors from states represented by Senators serving on the Armed Services Committee and the Defence Appropriations Subcommittee and which traditionally are citadels of military business, namely California, New Mexico, Massachusetts, Alabama and Washington. "In reality, SDI is an insurance policy that will do more to ensure the prosperity of arms manufacturers than to protect America from a nuclear attack," states CEP analyst Rosy Nimroody. "The companies that won the largest contracts to produce nuclear weapons in the last decade are the same ones winning the largest SDI contracts to make nuclear weapons obsolete in the next decade."

Deep inside the military-industrial complex there has emerged a special-interest group clustering around SDI and viewing it as a gosling that could grow into a goose that will lay golden eggs. The Pentagon's contractors are worried that SDI could get stuck at the research phase. The arms suppliers whose outlook is limited to matters of finance cannot learn the lessons of history, the pages of which, as one of President Dwight D. Eisenhower's aides, Dr Herbert York, used to say, are filled with "Maginot lines." To build another of these in outer space is to whip up the arms race.

But outer space should serve peace. It should only be used for peaceful purposes to benefit mankind.

ALEXEI ARBATOV,
D. Sc. (History)

STRATEGIC DEFENCE—IS IT UNAVOIDABLE, FEASIBLE OR NECESSARY?

The Reykjavik summit disproved one of the chief arguments in favour of "star wars"—that it can be used as a bargaining chip at arms control talks and contribute towards an American-Soviet agreement. Actually, SDI has become—long before the deployment of a large-scale missile defence system in space—a serious ostacles in the way of radical cuts in the strategic armaments. The meeting in the Icelandic capital has greatly catalyzed the political struggle over the space arms race issue both in and outside the United States. Current debates in the word's political, scientific and public quarters have raised in a new way many new aspects of this topical matter.

SDI is skidding

In his latest budgetary report Defence Secretary Weinberger said: "Our research on the technologies that could lead to highly effective ballistic missile defences signifies our interest to defend our territories and that of our allies. The SDI programme is an excellent example of our use of competitive strategies, has the potential to use U.S. and allied technological superiority to reduce the effectiveness of Soviet ballistic missiles, as well as encourage the Soviets to negotiate equitable arms control agreements."

For all the pains the Reagan administration and the Pentagon are taking to advertise progress in the field of SDI, many competent and objective experts refute their optimistic view of the project's prospects. Take, for instance, the conclusions drawn by the Soviet scientists' Committee for Peace, Against Nuclear War Threat, or by experts of the Federation of American Scientists and the Union of Concerned Scientists. What's more, dozens of experts directly involved in SDI-related research and development work testify there has been nc breakthrough in the programme over the past period; neither are there any grounds yet for presuming that such an anti-missile system is a realistic proposition.

On the contrary, the past few years have made it still clearer that the programme is up against enormous technical and economic problems. Intercepting ballistic missiles in the boost phase, as they emerge from the atmosphere, for instance, now appears to be much more of a problem than previously believed, although this is exactly the purpose of the multilayered BMD system's first echelon. Generalities apart, there is no way to ensure the invulnerability of space-based elements of the full-scale BMD system. Identification of real warheads among hundreds of thousands of decoys turns out to involve more and more difficulties. Besides, the other side can take electronic countermeasures capable of overloading and misleading tracking and guidance BMD sensor systems. Another major problem all the magnitude of which has become apparent of late is orbiting the space elements of the system in reasonable time and at a reasonable expense. Their deployment will require increasing the American potential for orbiting payloads many times over, and cutting the expenses involved to at least a tenth.

Although it asks for billions, the Pentagon's SDI Organization has not come up either with a clear-cut notion of the BMD system or with a direction of a long-term research programme. The problems connected with providing the industrial base to cater for the SDI project, and many others, are still awaiting their solution.

An expert report compiled for the U.S. Congressional Office of Technology Assessment furnishes explicit evidence to the effect that the strategic defence system will be unable to secure the survival of the U.S. population and economy in the event of a nuclear war.

The authoritative Aspen Institute calls in question the possibility of setting up, during the nineties, an BMD system with space-based elements which would conform to Paul Nitze's well-known criteria. This leading U.S. negotiator on nuclear and space arms deems it obligatory to ensure a high survivability of the system's space components and to impart to it qualities which would prevent the other side from neutralizing it by a simple buildup of missile forces at lower expense.

The above-mentioned and other assessments of the technological and strategic aspects of the "defence initiative" have had a marked effect on the Capitol Hill debates on the subject. In the budget for the fiscal year 1987, the Congress allocated $3.5 billion for SDI instead of $5.3 billion asked for, i.e., 34 per cent less. This is the biggest cutback on SDI allocations since 1984.

"We have made progress, but our ability to follow through on the success of the fiscal year 1986 is seriously hampered by the budget cuts," Caspar Weinberger commented on the Con-

gress decision. "Recent severe Congressional budget cuts have required us to review our approach and our plans on how to proceed in the fiscal year 1987."

Under the pressure of unsolved problems, the SDI programme is markedly departing ever farther from that put forward in 1983 by the presidential commission headed by James Fletcher. Almost a half of its projects have been suspended, curtailed or cancelled altogether. In particular, the orbital chemical laser kill system is no longer regarded as promising owing to its inefficiency and great vulnerability in orbit. The original expectations of the effectiveness of the nuclear-pumped X-ray laser have been lowered. Its purpose has been changed from destruction of missiles to selection of real warheads among decoys. The same goes for the charged particle beam accelerator and for some other directed-energy systems.

In the light of these developments, the Pentagon is making feverish attempts to pave the way for the "initiative." Early this year it put strong pressure on the administration so as to make it formally adopt a "broad" interpretation of the ABM treaty and approve a plan for an early deployment of a space anti-missile system (in the first half of the nineties), the idea being to scuttle the treaty beyond repair and make the arms race in space irreversible.

This pressure met with resistance in Congress. In his report Senator Sam Nunn gave an all-round analysis to negotiations records, the text of the treaty and Congress hearings prior to its ratification, and concluded that its "broad" interpretation was groundless. As a result, the plan for an early deployment of the system was called off—for the time being, at any rate. SDI supporters suffered another major setback.

Nevertheless, the "star wars" advocates would not lay down arms. So far they are seeking to block the Geneva talks on enforcing the restrictions imposed by the ABM treaty, and to keep deadlocked the dialogue on a drastic reduction of strategic offensive arms.

The opponents of an agreement realize full well that every lost round of talks on nuclear and space weapons leaves the door open for going ahead with this or that armament programme. Even Congress' decision notwithstanding, more than seven billion dollars earmarked for SDI over the past few years is amply sufficient to pay for the further advance of military technology. This makes reaching an agreement more difficult, and the arms race—less controllable still. The coming election campaign of 1988 should not be left out of account either. It is on record that a change of administration usually slows negotiations down but never causes an interruption in carrying out military programmes.

As the situation changes, so does the SDI advocates' tactics. The original "quintessence" of the idea which dawned on President Reagan in 1983—to create an impenetrable "astrodome" over America—has all but been relegated to oblivion. The emphasis has been shifted to a gradual, stage-by-stage development of a multilayered anti-missile system with different levels of limited effectiveness. Even if it fails to provide a solid shielding of the entire U.S. territory against a massive nuclear attack, the programme's supporters reason the system will make its outcome much less certain, lessen the likelihood of such an attack, and shift the strategic balance from offensive nuclear weapons to defensive systems not intended for destroying people and material values and not threatening anyone.

SDI has generated a multitude of myths, arguments and theories, quite a few of them amounting to accusations against the Soviet Union. All these myths are meant to spur on the arms race in space and, besides, to give the SDI adherents a pretext to evade its critics' awkward questions and to ignore their specific objections.

The shield and sword myth

Since the day in March 1983, when President Reagan made his famous speech, the shield-and-sword argument has become an invariable part of the case for SDI. In their perennial competition the preponderance of sword periodically gave way to the predominance of shield, and vice versa, the SDI supporters maintain. There are no grounds for regarding the predominance of offensive nuclear weapons over the past forty years as the finale of this age-old contest. Scientific and technological progress cannot be stopped. Consequently, nuclear missile offence will be inevitably replaced by defence which is to save mankind from the horror of mutual assured destruction.

Such is the trivial myth underlying SDI. For all its apparent dialectics, the whole thing is nothing but sophistry.

A dialectical approach to the problem does not consist either in mindlessly reiterating that defence has periodically prevailed over offence, or in "refreshing" this truism with modern technical illustrations. Dialectics calls, above all, for the admission that defence has never existed in a pure, clear-cut form. Arms and combat equipment designed for defence purposes were used in either defensive or offensive action, depending on the tactical or strategic objective of the armed forces.

And another thing: the shield and armour have always defended the warrior, not the ploughman. The life and property of the civilian population were protected not by defensive weapons as such but by its national army irrespective of what weapons and tactics it used in its defence strategy. Finally, we know from history that wars have had increasingly disastrous consequences for the population in the area of hostilities, regardless of which belligerent acted on the defensive.

Let us consider, by way of illustration, the SDI advocates' favourite analogy—the battle at Crécy in 1346, during the Hundred Years' War. In that battle, English archers routed the French mounted knights using long bows and an ingenious fighting tactics. If viewed from the dialectical and purely technical angle, that was obviously the triumph of offensive weapons—heavy arrows which pierced the knights' and their horses' armour. Tactically, defence prevailed because the archers stayed put in their positions while heavy cavalry charged them. Strategically, however, it was a victory for offence, because the English expeditionary army landed on the continent and invaded France.

The weapons and tactics of trench (i.e. defensive) warfare were used in World War I, for the most part. This tactics, however, helped the German troops (after they had attempted to realize the Schlieffen strategy) to entrench themselves on the captured territories for four years. The outcome of World War II was decided by offensive weapons and offensive tactics. Used by the aggressor in his brigand actions at the beginning of the war, they subsequently were used for the strategy of defence and liberation of the occupied countries in Europe and Asia.

Have nuclear missiles put an end to the alternation between defence and offence? Scientific analysis shows that they haven't. Today the contest between them has taken on entirely new forms characteristic of the nuclear epoch. From the dialectical viewpoint, this is only too natural considering the revolutionizing effect of these entirely new weapons on warfare and politics.

Tactically, the use of nuclear weapons (except interceptor missiles and atomic

demolition munitions) is of a pronouncedly offensive character. Strategically, they can play either a defensive or an offensive role.

The dialectics of this role is as follows. In order to conquer or destroy a state, its armed forces have to be routed first. A monopoly on nuclear weapons promised the U.S., at first, a chance to destroy any state without engaging its army and navy.

After the other side had acquired such weapons, however, it became able to strike a crushing blow at an aggressor in the same manner. An attack would have been suicidal unless it suppressed the other side's nuclear forces by a surprise blow. From then on, defence consisted not in protecting one's territory, but in the capability to take adequate retaliatory action.

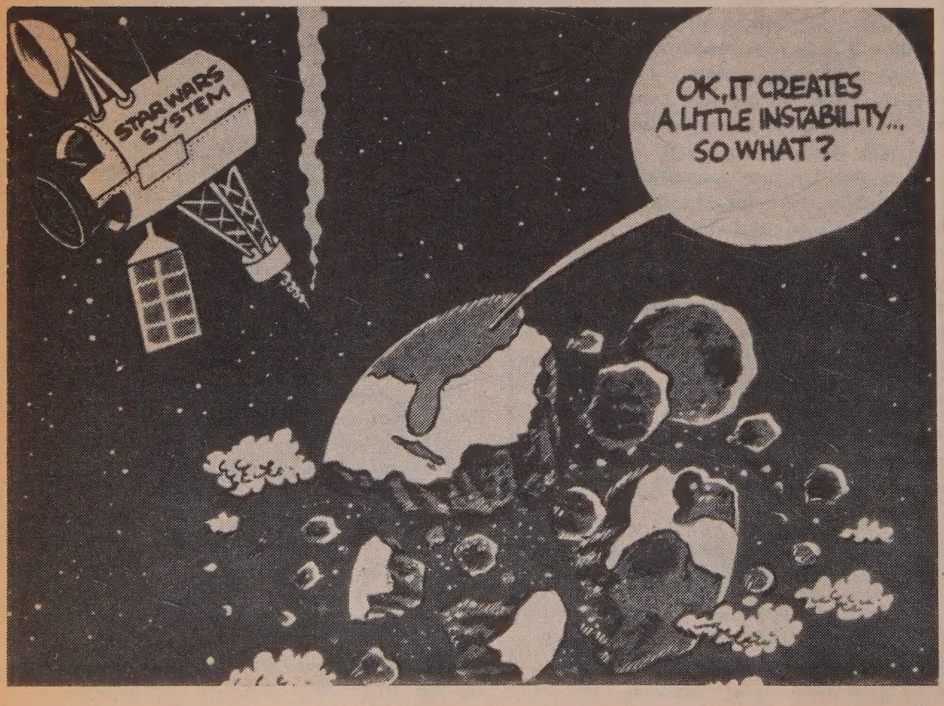
Consequently, in this age of nuclear missiles global defence on the strategic level takes the form of deterring an aggression by a retaliation potential, while offence takes the form of the first strike at the other side's deterrent forces, planned and carried out in such a way as to preclude retaliation or to reduce its damaging effect to an acceptable level.

The lower the first-strike capability of any or either side, the higher the prevalence of defence over offence in the strategic nuclear balance, and the lower the likelihood of a nuclear war being unleashed deliberately. And the other way round. The contest between offence and defence has been going on throughout the postwar years and is still in progress. Technically, it manifests itself in continuously improving target hitting accuracy, increasing warhead destructive power, heightening their retargeting flexibility and reducing flight time. On the other hand, strategic forces are becoming increasingly invulnerable owing to missile silo hardening, the mobility of launchers, missile-carrying submarines' undetectability. The early warning, combat control and communication systems are gaining in survivability thanks to multiple duplication.

Proceeding from this logic, defence predominates in the Soviet-American strategic balance today. Neither side can weaken, by a preemptive strike, the other side's retaliatory potential and to bring it down below the level of absolutely unacceptable damage. However, the introduction of new, more efficient nuclear weapon systems (such as MX, Trident-2 and cruise missiles) may provide more chances of destroying the other side's strategic means. A relative strengthening of offence in the form of counterforce capability threatens the stability of military balance.

How does a large-scale ABM system with space-based elements, which SDI is all about, fit into this picture? The most efficient ABM system physically and mathematically possible will not be able to provide reliable enough protection for the U.S. territory against a hypothetical massive nuclear strike. Even the most ardent advocates of SDI admit this today. The ABM "shield" is not an exception in this respect: throughout history, defensive weapons have always been protecting troops rather than the population. Combined with effective means of destroying the other side's strategic forces in a preemptive nuclear missile attack, such a system could greatly reduce the power of a retaliatory blow, weakened and disorganized by a surprise attack.

In this way, a technically and tactically defensive weapon system is capable of increasing strategic offensive potential to a substantial extent, and to augment the threat of a nuclear attack. If two such BMD systems, symmetrically confronting each other, appear, the mutual buildup of space-based nuclear weapons would undermine military stability and increase the possibility of a preemptive blow being struck in a critical situation. This is the chief reason why the Soviet answer to SDI must be asymmetrical.



The nuclear weapons obsolescence myth

Another myth goes that nuclear weapons will be inevitably superseded by new ones in the same way as cold steel was replaced by firearms, and the latter—by nuclear weapons.

This too is a case of historical dialectics being substituted by a primitive pattern. Although firearms appeared in Europe in the 14th century, sabres, spears and bayonets largely decided the outcome of battles for another five hundred years. Global military balance has been pivoting on nuclear weapons for forty years now. Never before, however, have the leading powers kept, in peacetime, such large and powerful conventional forces, or paid so much attention to the improvement of conventional weapons (the U.S. spends more than 60 per cent of its military budget on that). Tens of millions of people have died after 1945 in strictly "conventional" local wars. Instead of replacing old weapons, new ones complemented them and revolutionized the art of warfare in new and traditional spheres.

The SDI programme's emphasis on new means of destruction may materialize in the creation of new-generation space weapons such as laser kill systems, charged particle accelerators, microwave and electrodynamic railguns. There is no reason to claim, however, that these new weapons will oust nuclear arms. On the contrary, they might even expedite the advent of new, third-generation arms, all the more so that some varieties of these arms

are already being developed parallel with the SDI programme. Work is now in progress, in particular, on nuclear systems with selectively enhanced damaging effects by X-ray, neutron and thermal radiation, electromagnetic pulses, "clean" charges (with intensified blast-wave effect) and radioactive contaminating charges.

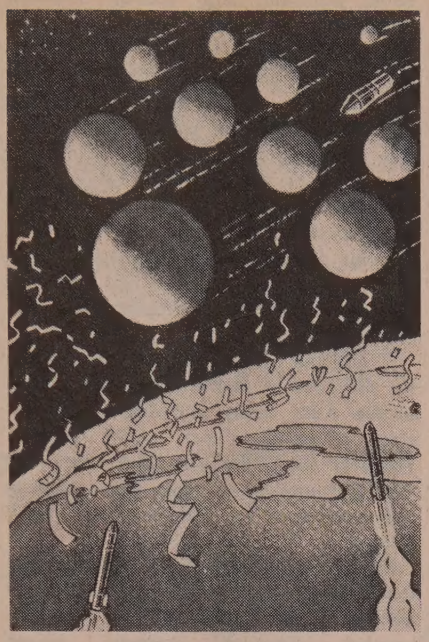
A nuclear war consequently will not become less absurd. But then, the "exotic" weapons will give strategists unlimited scope for devising most bizarre nuclear strike scenarios. Many combat missions, not identified with conventional weapons now, may well be assigned to new-generation nuclear arms in the long run. And on the contrary, what is now reserved exclusively for nuclear weapons (intercontinental strikes at hardened and mobile objects, for instance) may be taken over by non-nuclear facilities.

If they occur at all, technological breakthroughs of the "defence initiative" may, of course, revolutionize the armed forces in general and conventional weapons in particular, bringing not only directed-energy and kinetic (contact-impact) kill devices but, what's still more important, new (space-based included) reconnaissance, tracking, targeting, navigation and communication systems, data processing and automatic combat control supercomputers. Within decades, all this can transform military strategy and policy to an extent we cannot even imagine today any more than anyone could envision the military impact of the advent of electricity and the radio in the past.

It would be only logical to presume, however, that rather than put nuclear weapons out of use, this would cause a further erosion of the existing watersheds between nuclear and conventional weapons, between theatre and global missiles, between combat actions on earth, in space and from space.

Another side of the nuclear weapons getting obsolescent myth is the transition period theory which has become Washington's official line in this matter. In accordance with the so-called Nitze model, the period is to consist of three stages: first, continued SDI-related research and experimental work paralleled with the reduction of Soviet and American strategic offensive arms; second, the beginning of a gradual deployment of the BMD system which is to supplement offensive nuclear arms and to dominate over them to an ever greater extent; and third, the completion of the multilayered space-based ABM systems of the sides and the final elimination of nuclear weapons.

In reality, the three-stage model



One of the problems the SDI project has come up against is how to distinguish real warheads from hundreds of thousands of decoys and electronic countermeasures.

will, as likely as not, fail in its very first stage, because if a continued effort under the SDI programme wrecks the ABM treaty, the strategic offensive arms reduction talks will be blocked, and the next phase—the deployment of the BMD system components—would amount to the permanent arms race rather than to a transitional period. Operating on new physical principles, both sides' space weapons would immediately gain in their offensive capability and become more suitable for attack than for intercepting ballistic missiles. The vulnerability of these weapon systems in orbits and a practically instant speed of action of laser and particle-beam strike systems would increase the danger of a surprise attack aimed at breaching the other side's "space shield" for the attacker's nuclear missiles. In the long run, such a course of events may lead to the deployment in orbit of space-to-earth strike weapons, nuclear ones included. Even from a strictly technical angle, it is impossible to restrict the militarization of outer space to purely defensive anti-missile systems.

An important point is that the sophisticated multilayered space-based ABM systems will not lend themselves to full-scale testing under realistic combat conditions. Therefore they must be trusted to work at the first (and last) real try. This being impossible to guarantee, high nuclear potentials are bound to remain if only as an insurance against a catastrophic failure of the BMD systems.

Under the circumstances, mankind's advance toward the abolition of nuclear weapons would be blocked tight in the first and subsequent phases of the Nitze model.

The anti-missile stability myth

Over the past year or two, the emphasis in the "defence initiative" has been smoothly and almost imperceptibly shifted from protecting the entire territory of the country to covering, in the foreseeable future, chiefly the U.S. military installations (point defence systems), from removing nuclear deterrence (a lofty objective, no doubt) to a more prosaic function of enhancing the reliability of this deterrence. Attempts are being made to prove that the gradually introduced ABM systems of limited effectiveness will, first of all, be more reliable and, second, conducive to military-political stability.

The first claim is substantiated as follows: "hard targets" (such as ICBM silos and underground command bunkers) are much easier to protect against a nuclear strike than cities. Besides, the requirements put to ABM systems are much lower in this case. For instance, an ABM system of 50 per cent effectiveness would not prevent a catastrophic damage to the population and the industry, but would quite do for keeping a certain retaliation potential as a provision against a likely nuclear strike by the enemy.

Hard point ABM defence systems are believed to be factors of stability as they allegedly give the other side no chance to get away with the first strike. On the other hand, these systems are said not to detract from other side's retaliatory strike capability as they won't be much good for defending vast areas, let alone the entire territory of a country.

The advocates of such an approach claim it can contribute to progress in strategic offensive arms reduction talks. Today both powers keep enormous surpluses of offensive arms, because in the case of a surprise attack only the

surviving remainder of these arms could be used for a retaliatory strike.* Now, as the argument goes, if strategic forces are reliably protected by an ABM system, such surpluses can be reduced.

As distinct from other discourses on the subject of SDI, these arguments are on a more serious side. It is not by chance that they draw the attention of rather broad quarters in the U.S. and in the West at large, including that of certain opponents of outer space militarization. At a closer inspection, however, this line of reasoning reveals serious shortcomings. To begin with, most SDI projects still provide for space-based strike capabilities, including directed-energy weapons and sophisticated space detection, tracking and targeting systems. These are required for a global-scale ABM "astrodome," above all. In the foreseeable period, no orbital battle station will be necessary for defending hardened ICBM launching pads; this purpose can well be served by low-altitude ground-based interceptor missiles. Besides, the cost of a space-based ABM system would be out of all proportion to that of the strategic forces it is supposed to protect. That would be much cry and little wool, so to say. The space-based ABM system can be deployed not earlier than at the beginning of the 21st century. There is no predicting what offensive weapons will emerge by then and what survivability hazards they may be exposed to.

Another point to ponder is that the objects to be protected by such an ABM system in the United States account for less than 20 per cent of its strategic potential (silo-based ICBMs). As for other strategic components—missile-carrying submarines at sea and airborne bombers—they are not threatened by ballistic missiles and cannot be protected by the ABM system.

Although relatively less complicated and expensive, point-defence ABM systems are also easier to pierce (say by means of the MARV-type manoeuvring warheads). The contest between defence and the means of overcoming it would promptly call for trans-atmospheric intercepting devices and forward space echelons, for the expansion of point-defence ABM systems into zonal, national and global strategic defences.

The changeover to the creation of an ABM system meant to protect military installations will hardly facilitate the Soviet-American nuclear arms reduction talks, primarily for the reason that it will wreck the ABM treaty which allows each power to have just one complex of no more than 100 interceptor missiles each (which is obviously insufficient to protect one to two thousand strategic objects from thousands of nuclear warheads).

Could the U.S.S.R. and the U.S. agree, for the sake of stability, on a revision of the ABM treaty allowing an expansion of point-defence ABM systems? Those in the West who insist on that must be unaware of the consequences the opening of this Pandora box (safely locked in 1972) is fraught with.

First of all, the serious problems the Geneva talks have now come up against owing to the asymmetry in the two powers' offensive strategic forces would be complicated many times over by the imposition of the inevitable ABM systems' disproportions on the present picture. Even if ABM protection is allowed for all the ICBM bases, it will cover less than 20 per cent of the United States' strategic potential, and more than 60 per cent of the Soviet Union's. And in case ABM protection for an equal number of bases and (or) missile launchers is agreed upon, this will put the U.S.S.R. at a disadvantage vis-à-vis the U.S. in the number of the ICBMs left unprotected—and this in a situation where ICBMs constitute a larger component in the Soviet triad.

The two powers differ in missile bases location patterns relative to their administrative-industrial zones. The compositions of their offensive nuclear forces also differ, which puts unequal requirements even to point-defence ABM systems. Interaction between ABM and air defence systems would also create many problems. And what about the inevitable expansion of ABM defence caused by the likely contest between point-defence ABM systems and the means of penetrating them? In a word, point-defence ABM systems are viewed as a possibility for the eventual deployment of multilayered wide-scale BMD systems.

Second, it is hardly correct to speak at the present juncture of an interconnection between point-defence ABM systems and the potential of a retaliatory strike. The above-mentioned enormous surplus of nuclear destructive potential, which exceeds any reasonable defence requirements by far, makes it absolutely safe for both powers to reduce their strategic forces drastically without fear of their retaliatory strike capability being diminished. No ABM systems are required at all. On the contrary, with the nuclear arsenals being what they are now point-defence ABM systems would spur on arms buildup as well as stimulate "limited" and "protracted" nuclear war planning.

The reduction of Soviet and American strategic arms—first to a half and subsequently to a still lower level—is the only effective, sensible and direct way to ensure stability and equal security for both sides. In the process, the survivability of all the components of strategic forces is not to suffer, of course, nor should any side's first-strike capability increase either relatively or absolutely. In other words, the weapons each of the powers believes to be of first-strike danger should be subject to controlled mutual reduction, elimination and banning.

Consolidation rather than revision of the existing ABM treaty is the prime condition of that. Subsequently, it may prove necessary to restrict anti-submarine and air defences, and other forces and facilities having to do with strategic balance (non-strategic nuclear weapons, those of third countries, and others included).

The common lock myth

Another SDI myth goes that in future the United States and the Soviet Union will be able to deploy not only point-defence but national ABM systems jointly, to coordinated schedules, and that the U.S.S.R. may even reckon on U.S. co-operation, i.e., on the supply of American "high technology."

Let's face it: the interests of the two powers do not coincide in any point which could make such a cooperation possible. The Soviet physicist Lev Kovrizhnykh illustrated the absurdity of this idea by analogy with two neighbours, each suspecting the other of plans to burgle his flat and thus agreeing to devise a common lock for their front doors. If there is indeed the danger of burglary such a lock is useless, and if there is no such probability why have a lock at all?

It hardly takes expert knowledge to understand that a space-based ABM system has no magic secret one could share with the other side. It is a set of sophisticated technical devices surpassing modern offensive nuclear weapons in complexity and variety many times over. Affording the opponent an insight into the inner workings of these devices would mean making it easier for him to take countermeasures and to neutralize the system. What's the worth of all the talk about the exchange of SDI technologies if the U.S. government embargoes talk about the exchange of SDI technoother countries?

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* Estimates of these surpluses differ, but the fact remains that their potential for doing the other side unacceptable damage, calculated by the U.S. in the sixties (400 warheads of the megaton class to destroy more than 70 per cent of the industry and 30 per cent of the population) now constitutes less than 10 per cent of each of the two powers' strategic destructive capability.

Had the Soviet Union gone ahead with the development of a space-based ABM system of its own, it wouldn't have had any need for American technology. Our country is quite in a position to create its own analogues, let alone the fact that our system would in this case differ entirely from the United States'. After all, the composition, technical characteristics and geostrategic posture of the nuclear weapons threatening the Soviet Union significantly differ from those the American BMD system is being designed to counter.

The most important thing is that the country will provide an asymmetrical answer to it, and not necessarily in outer space, either. These countermeasures will render the American "star wars" system "impotent and obsolete," to use President Reagan's own words, even before its full-scale deployment is completed.

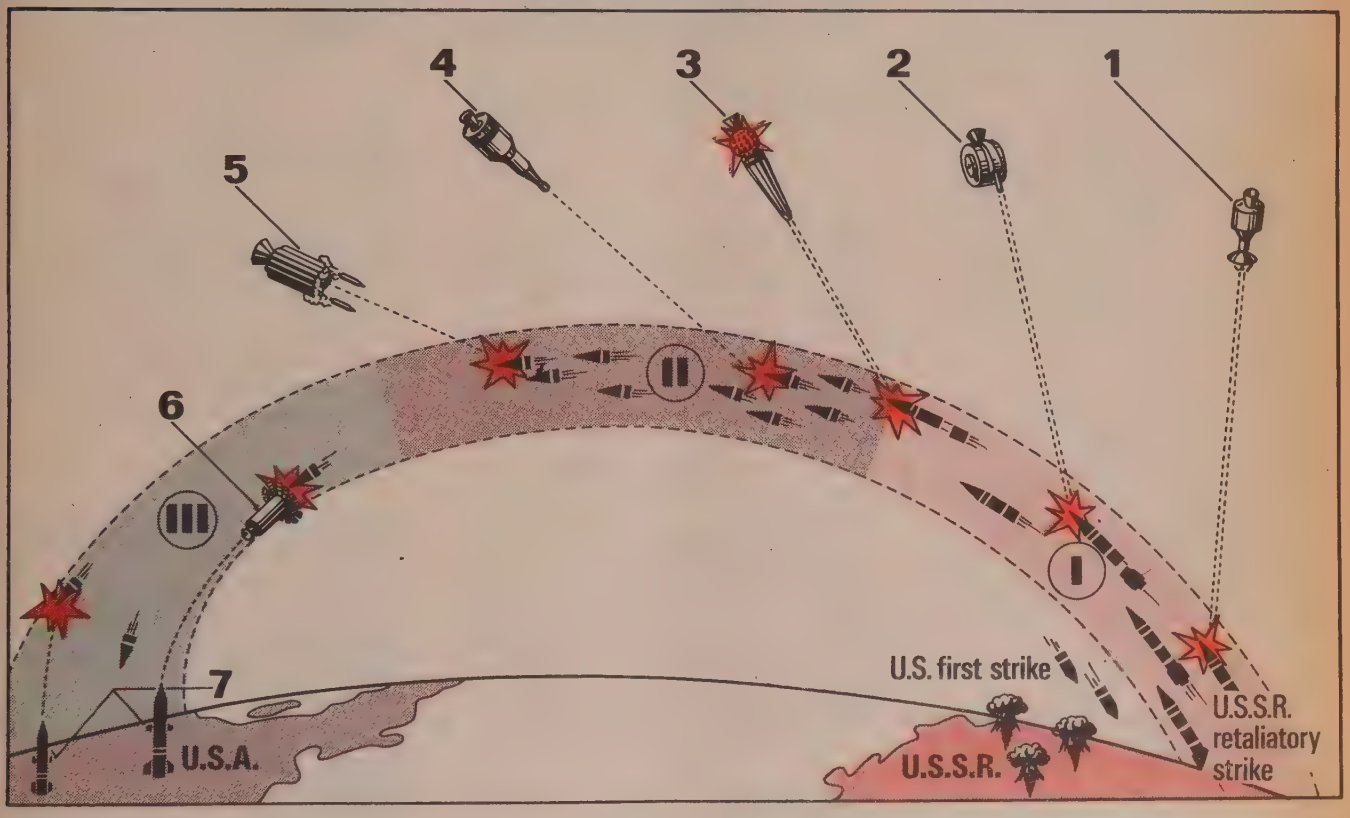
Are there contradictions in the Soviet stand?

Having thought up many contradictory arguments in favour of SDI based on ABM system unfeasible, the SDI supporters ask, why then is it so afraid of it? If unfeasible, it is not dangerous; but if dangerous, it is feasible.

There is no contradiction here, however.

The Soviet stand on SDI both at and after the Reykjavik summit was not prompted by fear or by a presumption that the Americans would succeed in building such a system after all. Research findings by prominent Soviet experts show beyond doubt that an impenetrable layered space-based ABM system is an impossibility. Not that some laws of physics rule it out. The explanation lies in that any version of such an ABM system will be effectively countered by the other side using the very same objective laws of physics. The real and fundamental paradox of SDI is that it contains the embryo of its own destruction. If carried out by the other side, most of the SDI projects can serve as countermeasures to space-based ABM systems. What's more, such countermeasures will be less complicated, cheaper, more numerous and easier to build. The laws of physics and astro-

A VERSION OF AN ABM SYSTEM WITH SPACE-BASED ELEMENTS NOW BEING DEVELOPED IN THE U.S.



1—chemical laser. 2—elementary particle accelerator. 3—nuclear-pumped X-ray laser. 4—electromagnetic gun. 5—satellite with self-homing small-sized missiles. 6—self-homing interceptor shell. 7—long- and short-range anti-missiles. I—ICBM vulnerability zone in the boost stage before warhead separation (altitude 10-500 km). II—ICBM vehicle and warhead vulnerability zone in space in the mid-course trajectory leg (altitude 500-1,200 km). III—warhead vulnerability zone in the terminal trajectory leg within range of anti-missiles (beyond the atmosphere at altitudes of 100-800 km, at low altitudes of 9-15 km).

U.S.S.R. is not going to take the road of the American "defence initiative" and to build up a large-scale space-based "layered" ABM system. If need be, our myths, its advocates are trying to parry the criticisms made by the opponents of "star wars." If the Soviet Union considers a highly efficient space-based

dynamics will be on the side of counteraction to the ABM system.*

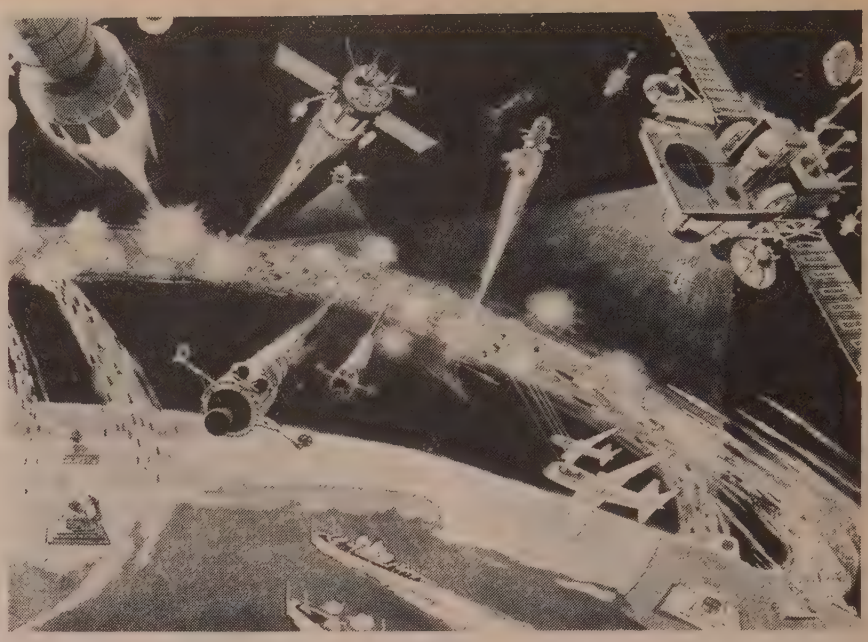
The feasibility of such counter-measures is a much more tangible guarantee against a full-scale ABM system than any formal U.S. pledges to abide by the treaty for this or that period.

An agreement on the non-withdrawal from the treaty and, what's even more important, on its mutually acceptable interpretation is essential to the stability of the international situation from the viewpoints of military strategy, politics and international law. It is in conditions of stability that agreements on drastic nuclear arms cuts can be reached. Otherwise, offensive arms will be built up and further improved, and means of overcoming anti-missile defence will be developed and deployed in good time. As Mikhail Gorbachev put it, "there immediately arises a situation which makes for uncertainty, increasing mutual mistrust and suspicion. You cannot reduce nuclear arms under such circumstances."

And another thing. While counteraction systems (laser and beam systems included) can neutralize space-based elements of a large-scale ABM system, ground-based counter-systems may become targets of a nuclear strike, and space-based counter-BMD devices may prove vulnerable to anti-missile space battle stations.

Besides, all these arms would jeopardize satellite surveillance, early warning and communication systems. Incidentally, it is these systems that both powers depend on for strategic deterrence, control over the compliance with the arms limitation treaties and following the developments in whatever critical situations may arise on the planet.

The Soviet Union does not doubt its ability to keep up with the Americans in nuclear potential and in the development of space-based weapon systems. However, a new protracted round of the arms race on earth and in outer space would be too dear a price to pay for convincing those bent on gaining military supremacy that their designs are unrealistic. This price consists not only in enormous economic expenditures of the states drawn into the arms race, but also in a rapidly increasing instability of the strategic situation and a mounting threat of a nuclear conflict escalating from a combat clash in outer space. This price would also consist in entrusting the fate of civilization to supercomputers with all the ensuing consequences in the event of a technical error.



What if this artist's view of SDI in action becomes a reality!

The ABM: literal and "broad" interpretation

The regime of limiting the ABM systems is largely determined by the agreed statement D appended to the 1972 treaty. The statement provides for the need to restrict (in accordance with Article III) the deployment of ABM systems or their components based on new physical principles. The true meaning of this provision (as reaffirmed by Senator Nunn's report recently) is that such systems and components can be developed and deployed only on ground-based stationary installations. Article III of the treaty says in no uncertain terms: "Each party undertakes not to deploy ABM systems or their components except" ground-based complexes within clear-cut quantitative, qualitative and territorial bounds.

As part of its "broad" interpretation of the treaty, the U.S. administration insists that point D allegedly allows the testing of systems based on new physical principles as well as space-based systems, and that such tests can be carried out in outer space too.

It would be appropriate to recall in this context that the objective interconnection between offensive nuclear arms reduction and anti-missile system limitation is recorded in the preamble to the ABM treaty itself. The deployment by one power of a large-scale ABM system (let alone that with space-based elements) can be taken by the other side only as a threat to its retaliatory strike capability—the basic deterrent against nuclear aggression. It was such interpretation of the fundamental realities of strategic balance by powers that underlay the ABM treaty. At the same time, the treaty imposes restrictions not only on the actual deployment of anti-missile systems but, what is no less important, on their development and tests. These restrictions involve long-term and costly procedures reliably verifiable by national technical means. The development and testing of a large-scale ABM system would be a clear indication of a departure from the treaty and a signal to the other side to take countermeasures in good time.

This is why Article V of the treaty bans not only the deployment but also the development and testing of ABM systems or components (space-, air-, sea-

* It is considered axiomatic among experts that, with all other conditions being equal, a larger laser is more powerful than a smaller one; that a larger laser is easier to build on earth than in outer space; that many directed-energy systems (X-ray lasers included) are more efficient in stratosphere-to-space than in space-to-atmosphere action; and that owing to their orbital motion and the earth's own rotation only a few space battle stations can stay put over the given points of the terrestrial surface. As a result, most orbital battle stations will always remain "off position" relative to the objects to be intercepted, and ground-based BMD systems will have to deal with less targets than space-based ones.

or mobile land-based ones), i.e., the systems most likely to breach tight quantitative and territorial restrictions (the 1974 protocol allows each side to have one anti-missile systems complex).

With a view to consolidating the treaty, the U.S.S.R. suggested to the U.S. that a concrete agreement be reached on the permissible scope of work on space-based missile systems so as to draw a sharp line of distinction between permissible research and banned tests.

As it insists on its freedom to develop and test new ABM systems, both on earth and in outer space, the U.S. seeks to remove the chief limitation provided for by the treaty, to bring SDI up to the deployment stage and thus make a breakthrough to strategic superiority over the U.S.S.R. As for the U.S. professed readiness to observe the treaty (while working it loose by its "broad interpretation"), these assurances are merely intended to lull the public into complacency.

In order to stem the tide of opposition in the U.S. and allied states to the policy of breaching the ABM treaty, the American ruling quarters have raised hue and cry against some alleged violations of the treaty by the Soviet Union, which is declared in the West to be developing its own version of SDI.

These allegations are most symptomatic in themselves. In 1983-84, when the "star wars" programme was on the rise, it was substantiated by arguments other than the need to "keep up" with the U.S.S.R. And now, in the face of public criticism levelled against SDI, its advocates resort to the old trick of alluding to the United States' "lagging behind" the U.S.S.R. in this field.

Lieutenant General James Abrahamson, ex-airman, head of the SDI Organization.

The pretext for charging the U.S.S.R. with "breaching" the treaty has mainly been furnished by the radar stationed near Krasnoyarsk. Article VI of the treaty bans the deployment of radars for early warning of strategic ballistic missile attack except at locations on the periphery of the national territory and oriented outward.

The Krasnoyarsk radar is not located on the periphery of the Soviet territory and is not oriented outward. The Soviet Union has officially explained, however, that this radar does not violate the treaty because it is intended for tracking space objects rather than for early warning of a ballistic missile attack. A special exception is made for such radars in point F of the agreed statements to the ABM treaty.

Representatives of the U.S. say they cannot distinguish the Krasnoyarsk radar from warning stations. But point F does not specify distinctions between these two types of radar. Obviously, a separate agreement must be reached on this issue lest there should arise any further misunderstanding.

Under the same article VI, the setting up of American radar stations in Greenland and Britain can also be regarded as a violation because they are not located on the periphery of the U.S. national territory. Washington claims these are only modernized versions of the radars already functioning there, although entirely new radar complexes are being constructed near old stations there. Point F makes no provisions for such a "modernization" at all.

There is no doubt that if the U.S. were actually concerned about the inviolability of the treaty, it would be no problem at all to reach a compromise agreement on radars and rule out any further misunderstanding. The fact that the American side would not negotiate such an agreement goes to show that the U.S. seeks to undermine the treaty rather than to strengthen it. The talk about "Soviet violations" is meant to remove all the barriers in the way of SDI.

As for assertions about "Soviet SDI," the U.S.S.R. has repeatedly announced, at the most authoritative level, that it has no such programme. We maintain and keep improving just one ABM complex around Moscow in strict keeping with the letter of the treaty. Following its 1983 moratorium on any tests of anti-satellite systems, the Soviet Union has not been developing any kind of space weapons. Soviet military space programmes have to do exclusively with early warning, reconnaissance, navigation and communication satellites.

Again, if the U.S. has a fear of "lagging behind" the Soviet Union, the best way to resolve the issue is to reach a comprehensive, strict and reliably verifiable agreement setting the permissible limits to research and development work in the field of ABM defence.

The ABM treaty regime — especially the restrictions it imposes on the development and testing of space ABM systems—must be strengthened not because the U.S.S.R. is more interested than the U.S. in observing it, or because the U.S.S.R. fears to fall behind the U.S. in military technology. The consolidation of the ABM system limitation regime is necessary because it alone can provide a prerequisite for drastic cutbacks in nuclear arsenals, for the strengthening of military-political stability and universal security. The U.S.S.R., the U.S. and other countries are equally interested in that.

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ALEXEI KIREYEV, Cand. Sc. (Econ.)

WHO WILL PAY FOR "STAR WARS"

The time that has elapsed since the official adoption of SDI as a political doctrine has furnished clear proof that it pursues more than just military-strategic aims. Devised as military-technical support for Washington's great-power policy at the new stage of the scientific and technological revolution, the "star wars" programme also has a practical aim, namely, to help U.S. imperialism achieve a technical level that will enable it to leave its partners-cum-rivals far behind, make rapid strides in the economy, and place its allies under stringent control.

The boat is leaving

President Reagan's entourage feigned surprise when he first mentioned the need to create a "space shield" to ensure the national security of the United States. But Reagan's advisers must have seen clearly the direction in which U.S. space plans would develop.

It is enough to recall the NABS (Nuclear Armed Bombardment Satellites) project of the early postwar years. It provided for the orbiting of nuclear-armed satellites which could at any moment hit a target in any part of the world. Or take the project of the 1960s to launch a manned orbital laboratory to carry out military experiments.

The Department of Defence was the first U.S. agency to get appropriations for space research. True, in 1958 President Eisenhower set up the National Aeronautics and Space Administration (NASA) to explore outer space for civilian purposes. However, the military immediately began to use this agency, too, "in the interests of national security."

Military space programmes were financed at the expense of NASA, while the manned vehicles built by the agency were used by the Pentagon for its own purposes. Thanks to big investments in the Apollo and space shuttle programmes, the NASA budget in the 1960s and 1970s exceeded the Pentagon's appropriations for military space research.

The military orientation of space programmes, announced as civilian, fitted in with the strategy of using space for military purposes adopted by the administration from the early years of space exploration.

After Reagan had taken office, expenditure for the military use of outer space spiralled upwards, exceeding the NASA budget in 1982. Investment in military-space projects more than doubled, reaching $18 billion by 1987. In the meantime, allocations for civilian space research increased at a much lower rate.

Long before the Strategic Defence Initiative was announced, the U.S. administration was spending considerably more money on space research for military than for civilian purposes. In the period from 1970 to 1984 an estimated $291 billion was expended on military space research and development compared with $139 billion on civilian space research. Furthermore, the arms and aerospace corporations, thriving on Reaganomics, have invested tens of millions of dollars in the development of what they regard as promising weapon systems.

The authoritative journal New Scientist has written with reason: "Many of the projects now funded under the SDI office began years ago. Laser weapons, rail guns, chemically powered rockets are a few examples. Some companies had already started projects on their own initiative. What the SDI office headed by Gen. James Abrahamson has done is to organize these projects into a platoon, bring a new lot on board, and announce that the boat is leaving, you're either on or off."

The cost of reanimating the genie

In spite of unceasing calls and publicity, the administration is disquieted by growing criticism of SDI and, as it believes, inadequate funding of the programme by Congress. Since the fiscal year 1984 the "star wars" programme has been quoted as a separate item in the military budget. Moreover, the Pentagon and NASA have a joint $12 billion research programme through which a part of the NASA funds can be drawn for the implementation of SDI. Nevertheless, the greater part of the funds for "star wars" is received by the Defence Department, specifically by the SDI Organization, and these funds are usually regarded as the SDI budget.

In the early years of the programme Congress cut back on the sums requested by the President to finance it. The legislators have little faith in the "space shield." They are also alarmed at the dangerous growth of the federal budget deficit and the lack of appreciable progress in the development of SDI components. Congressmen are particularly irked by the fact that the Pentagon is

asking for funds for a programme the cost of which as yet unkown.

According to press reports, the cost of the SDI project ranges from $1.5 to $3 trillion. But none of these figures has been recognized by the Pentagon as official. Speaking in a Senate subcommittee in March 1987 and again praising the merits of the "space shield," James Abrahamson admitted nevertheless that he was "not prepared to give an exact cost estimate of an SDI system because, quite frankly, it cannot be responsibly done."

In an attempt to compensate for the cuts of the previous years, the Pentagon asked Congress to appropriate $5.2 billion for SDI in 1988 and $6.3 billion in 1989. Furthermore, a sum of $500 million was requested in addition to the funds allocated for 1987. As before, all these funds are to be distributed among the five major sub-programmes of SDI, with only a small part left for organizational and management expenses (see table on p. 14).

The table shows that about 40 per cent of the appropriations for SDI is to be spent on new types of weapon: directed energy (laser and beam) weapons and kinetic energy weapons—interceptor shells and electromagnetic guns. The rest will go on up-to-date computers and software and the creation of artificial intelligence, new materials and sources of energy.

The Department of Energy also has considerable funds for the SDI programme, especially for nuclear tests to develop a nuclear-pumped Roentgen laser. Between 1987 and 1991 appropriations for this purpose are to be increased from $500 million to $850 million. Thus, the agency whose job it is to deal with energy problems is actively helping the Pentagon to implement SDI. Even Assistant Secretary of Energy Sylvester Foley has been compelled to admit that SDI is the number one research and development project for his department.

No wonder such an orientation results in many civilian programmes being cancelled, and is arousing well-founded concern among Americans.

While Congress is discussing how much to allocate for SDI in 1988 and 1989, the administration is careful not to put strong pressure on the legislators because of its lame interpretation of the ABM treaty. Some analysts believe the White House is taking its time about giving a clear definition of its stand on the matter because Congress might rebel against an interpretation of the treaty broad enough to justify the testing and deployment of SDI elements, in which case appropriations would be cut down. Other analysts are of the opinion that the White House's interpretation of the ABM treaty will depend on how much it gets from Congress for the SDI programme.

Notwithstanding the obstacles, President Reagan seems to be prepared to fight for his brainchild to the bitter end. Since abstract theorizing about the "effectiveness of a space shield" no longer brings political dividends, the administration has intimated that the first echelon of SDI might be deployed by 1994. According to various estimates, $60 to $100 billion will be required for this purpose. "How are you going to convince Congress to spend that kind of money if all you have are a few blips on an oscilloscope screen," U.S. News and World Report asks. "The reason they need to keep it out in the field is much more political than technical."

President Reagan, who leaves office after the 1988 elections, is extremely anxious to hand over at least part of the space sword of Damocles to his successors and is therefore trying to give the maximum impetus to the SDI programme. This also explains why he is trying to get big appropriations, make huge contracts, and even deploy some elements of the SDI programme in outer space. "They [members of the administration—**A.K.**] want to pump enough money into the programme to institutionalize it before they leave office. They hope that if they get enough defence contractors in enough states hooked on the programme, Congress could never undo it," Congressman Charles Bennett thinks, not without grounds.

According to the West German magazine Wirtschaftswoche, $20 to $25 billion will have to be allocated to SDI so that it picks up enough speed and is not wound up after Reagan leaves the political scene. By the beginning of this summer, the Federation of American Scientists reports, contracts worth roughly $11 billion were con-

RELATIVE COST OF MAJOR U.S. PROJECTS THIS CENTURY
(in current prices)

Panama Canal
$16 bln

Manhattan Project
(creation of A-bomb)
$10 bln

Apollo Project
(man landing on the Moon)
$100 bln

"Star wars"
over a trillion dollars

cluded under the "star wars" programme. The anxiety of the Reagan administration about reductions in SDI funding are easily understood. This administration is seeking not only to reanimate the genie but also to let it out of the bottle before Reagan's term of office expires. This, the White House believes, will commit the succeeding president to a strategic policy wedded to "star wars."

Battening on the Pentagon's contracts

The prospect of raking in windfalls from the SDI programme has attracted large military and aerospace corporations and research centres, most of which have strong, long-standing links with the arms business. More than 600 big contracts for research work involving over 90 research centres have already been signed under SDI, and about 70 industrial and commercial firms and laboratories have been drawn into the programme.

Judging from press reports, the specialization of these corporations and research centres can to some extent be determined. For instance, Lockheed has developed anti-satellite weapon guidance systems, the Talon Gold laser guidance system, space-based interceptors of intercontinental ballistic missiles, space observation systems, and ancillary equipment for lasers. The TRW concern is designing chemically-powered and free-electron lasers, new-generation computers, and observation systems. Boeing is conducting research in the field of air-based optical tracking systems, lasers, electromagnetic guns, and ABM software. McDonnell Douglas is working on thermal protection, space interceptors, laser accelerators, and infrared sensors. Raytheon has been granted a contract for the construction of a special ground-based radar, the key research project of SDI, according to the Defence News magazine.

MAJOR CONTRACTORS OF SDI PROGRAMME IN 1983-86

	Volume of contracts (mln dollars)
1. Lawrence Livermore laboratory	725
2. General Motors	579
3. Lockheed	521
4. TRW	354
5. McDonnell Douglas	350
6. Boeing	346
7. Los Alamos laboratory	196
8. Rockwell International	188
9. Teledyne	180
10. E G and G	140
11. Gencorp	135
12. Textron	93
13. Sandia laboratory	91
14. LTV	90
15. Flow General	89
16. Raytheon	72
17. Science Applications	69
18. Honeywell	69
19. Nichols Research	63
20. MIT Lincoln laboratory	63

Big corporations have reorganized their production management with the aim of ensuring the quicker and more efficient fulfilment of orders. The post of vice-president responsible for SDI, with the appropriate personnel under him, has been introduced in the top managerial echelons. In Boeing, for instance, an aerospace department has been set up to develop space-weapon systems, while Rockwell International has established a strategic defence centre for the purpose.

Among the main SDI contractors are four state-owned nuclear research laboratories. The Livermore laboratory was one of the first to begin space-weapon development in the early 1970s. It is studying combat use of lasers and experimenting in the field of nuclear fusion and charged particle energy control. The Los Alamos and Sandia laboratories have devised beam weapons and are continuing research in this field. The Lincoln laboratory at the Massachusetts Institute of Technology is specializing in computer software.

A prominent place among the contractors is held by the E G and G corporation, which runs the Nevada nuclear test site.

The Pentagon is also drawing universities into "star wars" research. The U.S. National Science Foundation estimates that the Defence Department today accounts for 19 per cent of all federal appropriations for research in universities and colleges, compared with 10 per cent in 1980. This means that one dollar in every five goes on military research. It will be recalled that the United States only spent so much for the same purpose at the height of the Vietnam war. In the past three years 79 American universities and colleges have been awarded SDI contracts to the tune of $328.9 million.

It is important to note that of the 37,000 contractors and 100,000 subcontractors battening on the Pentagon's orders, only a small group of corporations and research centres, which are seeking to monopolize the space business, have really been able to get sizable slices of the SDI cake.

In his "Capital," Marx quoted an English historian who observed that a profit rate of 50 per cent makes capital audacious, 100 per cent ready to trample on all human laws, while for a profit rate of 300 per cent there is not a crime at which capital will scruple, or a risk it will not take, even the chance of its owner being hanged. But if the militarist scorpions of the past merely stung weaker rivals in the scramble for profit, competitors in the present-day transnational arms drive now being extended by the Pentagon to outer space, seem prepared to sacrifice humanity in pursuit of the golden calf.

Where to get the money for SDI

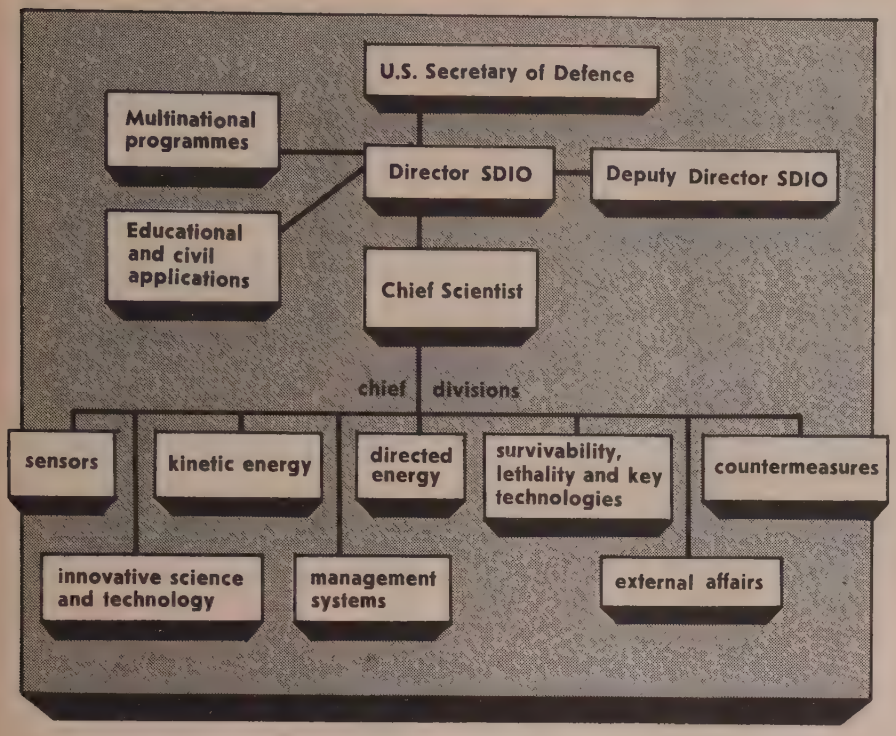
The advocates of the space ABM system pass over in silence a question of principled importance: where is the United States, with its state debt of $2 trillion, going to get the money for the SDI programme? For even today when appropriations for SDI make up one to two per cent of the military budget, this problem does not seem exaggerated. In the not too distant future tens and perhaps hundreds of billions of dollars will have to be invested in "star wars."

The influential Wall Street Journal is sounding the alarm. "Just keeping U.S.

FINANCING OF SDI FROM DEPARTMENT OF DEFENCE BUDGET (the administration's request for fiscal years 1988 and 1989)

	1988 bln dollars	%	1989 bln dollars	%
Surveillance, acquisition, tracking and kill assessment	1.49	28.5	1.86	29.6
Directed-energy weapons	1.10	21.2	1.25	19.9
Kinetic-energy weapons	1.07	20.5	1.20	19.1
System analysis and battle management	0.63	12.0	0.79	12.5
Research and development	0.90	17.2	1.16	18.5
Programme control	0.03	0.6	0.02	0.4
Total	5.22	100.0	6.28	100.0

SDI ORGANIZATION



The "star wars" programme is being directed by the SDI Organization set up as part of the Pentagon. It is headed by Lt.-Gen. James Abrahamson, who is directly subordinate to the Secretary of Defence. The SDI Organization is not large, but it is staffed with highly skilled personnel (80 in 1986, including 60 experts and 20 auxiliaries). The organization has been charged with the coordination of all work in the building and deployment of space-weapon systems, and the distribution of funds for individual subprogrammes and industrial contractors.

strength at its current level already is posing the economic dilemma of printing money, borrowing against future taxpayers' earnings or imposing heavy burdens on present ones," it writes. "The President's plan will inevitably self-destruct under cost pressures," the Boston Globe warns. These are well-founded apprehensions.

During the entire Reagan presidency the U.S. state budget deficit has been relentlessly growing. The main reason for this growth is the Washington-spurred arms drive. During Reagan's first term in office, current budget receipts covered a mere 40 per cent of military expenditure. The corresponding figures were 83 per cent under the Nixon administration and 52 per cent under Ford and Carter. This means that the United States covered 60 per cent of its military expenditure through loans.

The growth of the budget deficit leads to the growth of the state debt, for which the nation has to pay. The payment of interest alone constitutes about 14 per cent of all federal outlay. By drawing free capital to the Pentagon the state is depriving civilian production of new investments.

Till early in 1985 Washington was able to extricate itself from this situation by attracting resources from abroad with the help of high interest rates. The influx of capital exceeded its outflow. This enabled U.S. imperialism to make other countries effectively finance its vast arms programme without bringing living standards down to a level that would arouse mass discontent with Washington's militarist course.

However, the United States lost its competitive position on many world markets. For this reason Washington has recently manipulated the dollar rate by letting it fall and thereby making American goods cheaper and more competitive and as a result, facilitating the self-financing of corporations.

All this helps the U.S. economy to keep going but brings none of the resources so necessary for the Moloch of war. The Pentagon is compelled to juggle with its budget, hoping to use funds for SDI that could be released with the completion of a number of big military programmes in the next few years. But who will guarantee that the military-industrial complex will not try to replace these programmes with the more costly ones? The debate on the possibility of creating new offensive weapons has already started. Besides, even the military budget cannot be inflated all the time.

It may be that the carry-overs, that is, the sums allocated by Congress to the Pentagon but not yet drawn upon by the latter, will be used to finance SDI. Accumulating year by year, this "invisible" military budget had reached about $280 billion by the end of 1985. But these funds have been appropriated for specific weapon systems and are intended for certain military contractors. Their redistribution in favour of SDI is bound to stir political passions in Congress, where the military-industrial lobby is becoming increasingly active.

Thus, in the 1980s, Washington has virtually exhausted the sources to finance its defence policy. But it is unwilling to admit this and continues to borrow money against the future.

The economic folly of SDI

To justify the creation of "star wars" weapons, the advocates of SDI assert that it will accelerate scientific and technological progress not only for military but also for civilian purposes, provide an extremly cost-effective defensive system, keep industry going for years, and ensure new jobs.

Let us examine these claims. The cost-effectiveness of a weapon system is determined by the ratio of its cost per unit to the value of the destruction it causes. On this count the nuclear weapon is considered the most effective: a warhead worth about a million dollars may cause a billion dollars' worth of damage.

SDI, Washington alleges, is a space shield against ballistic nuclear missiles, that is, against the most cost-effective weapon. Hence the penetration of even a small number of these missiles through the space ABM system—a possibility not excluded by Pentagon gen-

erals—will do incomparably greater economic damage than other types of weapons. This alone makes SDI economically inexpedient as a means of security.

The cost-effectiveness of such a system is also determined by the ratio of its cost to possible outlays on countermeasures by the other side. It is in fact a variant of the eternal problem of the relationship between offensive and defensive weapons. "In this competitive struggle between armour-plating and guns," Engels wrote, "the warship is being developed to a pitch of perfection which is making it both outrageously costly and unusable in war."

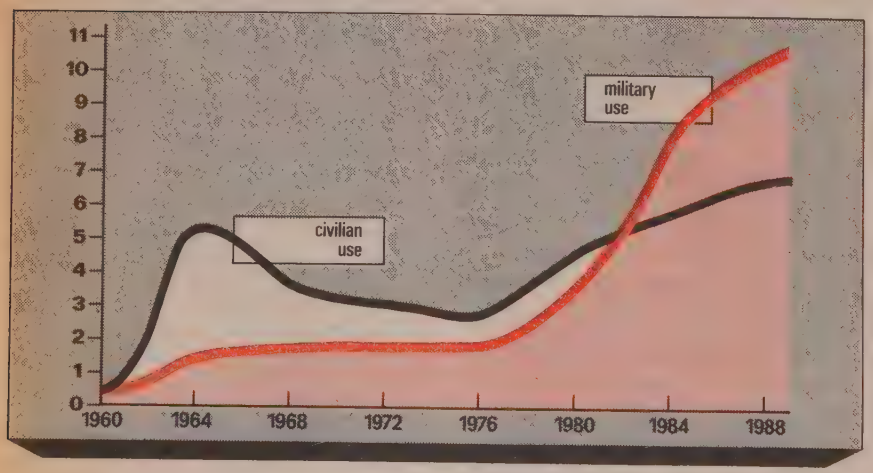
Of course, progress in military technology can give a boost to civilian branches. But the question should be posed in a different way: what price will the United States and its allies have to pay for the civilian uses of the results of military research under SDI? Most analysts agree that the military way of achieving civilian objectives is ten times more expensive than the peaceful way.

The sophisticated SDI system will in most cases be utterly unsuited to civilian purposes. "What use can civilian branches find for, say, new lasers that will make holes in metal plates at a distance equalling the distance between Hamburg and Lisbon?" the West German magazine Stern writes ironically.

This conclusion is borne out by experience. Declassified documents relating to the Pentagon's activity show that of the 7,988 inventions patented by 100 major contractors to the Defence Department between 1949 and 1959, only seven per cent had possible civilian applications. Of the 328 patents received in the course of carrying out NASA's research programmes until 1963, only 16 per cent have civilian applications.

The same can be said of the "beneficial" effect of growing military expenditure on employment. The People's Daily World estimates that a billion dollars would be enough to create 187,000 new jobs in the educational system, about 139,000 in the health services, 100,000 in construction, 92,000 in transport, and only 75,700 in the military sector. Thus, the growth of military expenditure results in the loss, not increase, of jobs. Victor Perlo, chairman of the economic commission of the U.S. Communist Party, believes that 14 million new jobs could be provided by using the funds Washington is to spend on SDI.

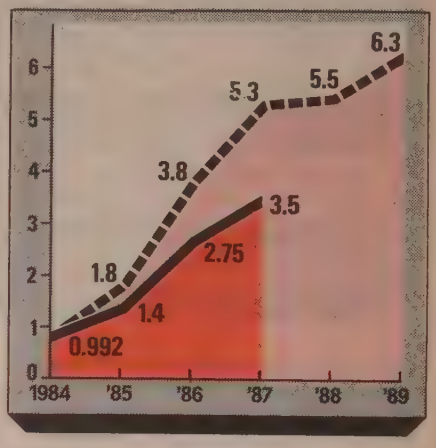
U.S. EXPENDITURE ON SPACE RESEARCH AND UTILIZATION (bln dollars)

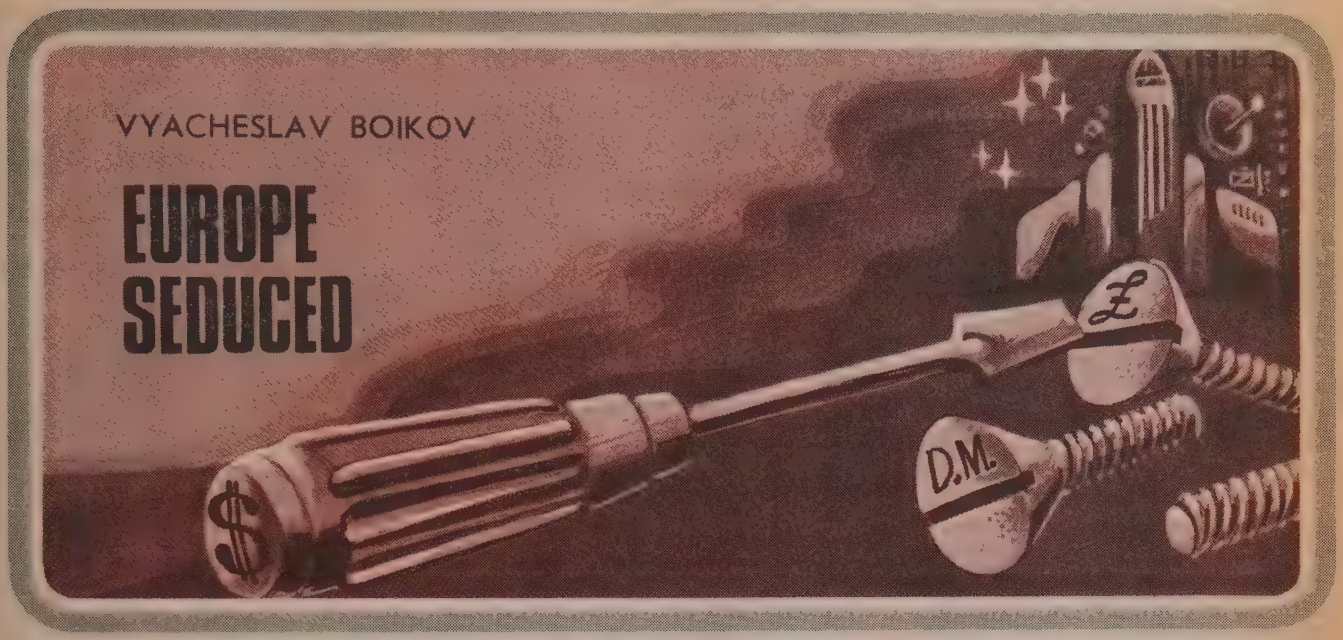


Furthermore, the expansion of work under SDI may spark off a new wave of inflation, a sharp rise in prices and, consequently, a fall in the real incomes of American working people because, according to some estimates, every ten billion dollars invested in military programmes increase the rate of inflation by 0.3 per cent. Since trillions of dollars are to be spent on SDI, such apprehensions are apparently not entirely groundless.

It is perfectly clear, therefore, that the strategic advantages the United States intends to gain with the help of the space militarization programme willl not match its prodigious cost. The "star wars" are already placing an oppressive burden on the chronically sick capitalist economy. Unwilling to accept the fact that the arms race is running increasingly often into problems of an economic character, the military-industrial complex is playing a suicidal nuclear game. ■

PLANNED AND ACTUAL VOLUME OF SDI PROGRAMME FINANCING FROM DEPARTMENT OF DEFENCE BUDGET (bln dollars)





The overwhelming majority of West Europeans reject SDI, I was told by Björn Pettersson, Deputy General Secretary of the European Trade Union Confederation, which has a membership of 44 million working people. "We agree to see 'star wars' in films only. It's cheaper and safer," he said. Public opinion polls confirm this view. There is no such unanimity, however, in the political quarters in the Old World. Some are completely in favour of SDI, others have reservations about it, still others are against, or uncertain.

Stick-and-carrot policies

"For a long time, the leading allies of the United States looked at President Ronald Reagan's Strategic Defence Initiative with reluctance, scepticism and confusion," The New York Times wrote. Washington's plans came under fire from even its most loyal allies. In the absence of talks and restraint, we could see outer space being turned into another horrible theatre of operations, British Prime Minister Margaret Thatcher said. And F.R.G. Defence Minister Manfred Wörner declared that in the final analysis the implementation of SDI would not lead to stability; it would have the opposite result.

The Washington administration, eager to protect its brainchild, assessed critical remarks from West Europeans as a failure to grasp "complex matters" in full measure. A White House spokesman, for instance, attributed Margaret Thatcher's stand to unsound advice from her assistants. "Well, I'll get them to understand what it is," was the reaction of the White House incumbent to the allies' initial refusal to give his plans their support.

A massive effort to make West Europeans change their minds was launched by the U.S. administration. Ronald Reagan and his closest associates tried to make visiting European leaders see the light. Washington's emissaries started to frequent Bonn, London, Paris and other capitals. American politicians and experts were eager to participate in debates on radio and television, publish articles in the West European press and give interviews. An attempt was made to convince the allies that there were no grounds for concern over "star wars." It was asserted that the project was merely at the research stage and it was still too early to say where it might lead. And at the same time it was emphasized that the United States did not seek military superiority and was merely trying to avoid falling behind its adversary. Other propaganda arguments aimed at slandering the Soviet Union were resorted to. But it was "Atlantic solidarity" that Washington particularly stressed in its efforts to sway the allies.

It must be admitted that the massive pressure was not without effect. The tone of the speeches of certain Old World leaders started changing. First F.R.G. Chancellor Helmut Kohl and then Margaret Thatcher showed "interest" in the American research... with the reservation, however, that it was only research that they supported. The Canadian Globe and Mail noted with regard to these reservations that it was naive, to say the least, to expect Ronald Reagan's "star wars" project to end at the research stage. Having spent $26 billion, the Pentagon will not be forcing the genie back into the bottle.

The instigators of the space venture were gleefully rubbing their hands when the political pendulum started to swing in the opposite direction. The U.S. "star wars" plans drew the sharp and well-substantiated criticism from British Secretary of State for Foreign and Commonwealth Affairs, Geoffrey Howe. He pointed out the dangers of creating "a new Maginot Line."

To stem the rising tide, Washington played its "trump card": it promised profitable contracts and access to new technologies obtained as a result of joint research to its allies. Washington officials emphasized that if Western Europe let this chance slip it would lag hopelessly behind the U.S. And they inferred that it applied not so much to the military sphere as to civilian branches of the economy.

In March 1985 Washington extended a formal invitation to its allies to join in the development of the "star wars" programme. The offer was advanced at a meeting of the Nuclear Planning Group in Luxemburg. U.S. Defence Secretary Caspar Weinberger gave his counterparts two months to consider the proposal and asked them to indicate the area of research in which their countries could participate.

The first reaction to Caspar Weinberger's call was not a heartening one for Washington. The 60-day term was viewed as an ultimatum. The Pentagon chief saw that a little diplomatic pliancy was called for. He intimated that he would not object to their taking more time to consider the proposal. The Danish Folketing (parliament) adopted a resolution binding the government to

oppose the "star wars" project. Greece immediately stated its refusal to take part in the research.

At the same time West European military-industrial quarters took the financial and technological bait and became the more eager for dividends from the Pentagon's space contracts. British Minister of State for Trade and Industry Geoffrey Pattie said, for example, that British corporations were delighted at the prospect of gaining access to the bonanza. Even before the Nuclear Planning Group meeting, the F.R.G. Defence Ministry drew up a report listing eleven areas of research that might be of interest to West German firms.

And what about sober-minded West Europeans? They were gripped by anxiety about Washington's seductive advances and the aspirations of industrialists in their own countries. "Europeans, watch your pockets!" the Belgian Drapeau Rouge commented on Caspar Weinberger's invitation. "What the allies can count on are mere crumbs from the American space pie, and no say when it is being cut," wrote the Luxemburg Le Républicain Lorrain.

The French L'Express warned that it would be unreasonable to have much hope that, in return for political support for "star wars" plans and consent to scientific cooperation, the United States would agree to throw the doors of its laboratories open to its European allies and share its secrets with them....

Aside from the promise of gain and technological advantages, representatives of the ruling circles in a number of U.S. European allies also had other enticements to join in the "star wars" plans. One of them was pointed out by associate director of the Paris International Relations Institute Pierre Lellouche. He wrote in the American magazine Newsweek that unlike the winners of the second world war, the vanquished had been denied the opportunity to join the nuclear club. Space now offered them the chance to make a historic leap across 40 years of nuclear arming. History had given them no chance to become nuclear powers. New technology could make them space powers.

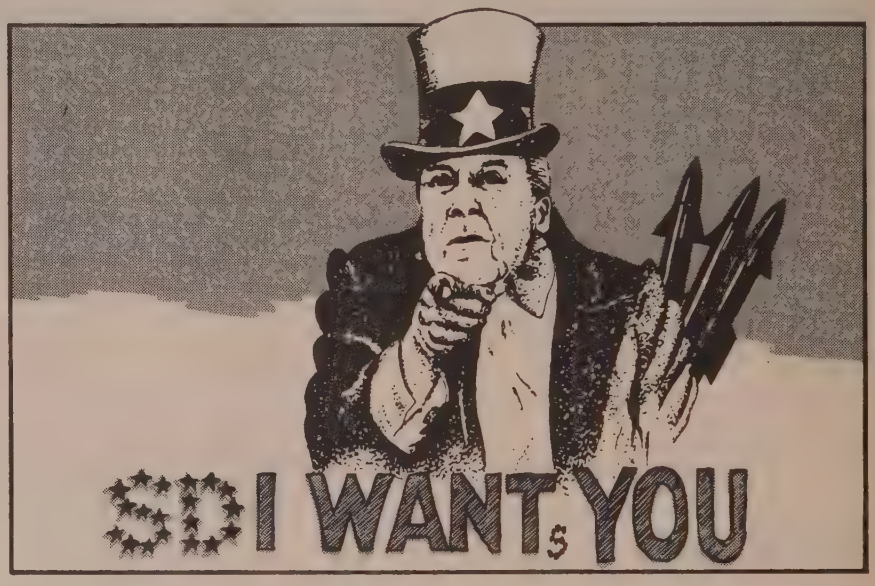
Britain was the first country formally to join in SDI. The agreement to this effect was signed in December 1985. The F.R.G. "surrendered" three months later, and Italy joined SDI in September 1986. France, the Netherlands, and a number of other countries declared that they had no intention of following suit, but did not object to participation by their firms in the SDI programme. The leaders of those countries thus disavowed their initial criticism of SDI and closed their eyes to its inherent dangers. Why so?

In answer to this question, a prominent expert at the French Foreign Ministry, Benoît d'Aboville, related the following parable. The Pope at Avignon dreamed of talking with his mule. So he promised a large sum of money to whoever could make his dream come true. One peasant answered the Pope's call and went home with the reward, having promised the Pope that his mule would talk in ten years. People in the village asked him what he hoped for. And he answered: "Ten years is a long time. In ten years either the mule, the Pope, or myself will be dead."

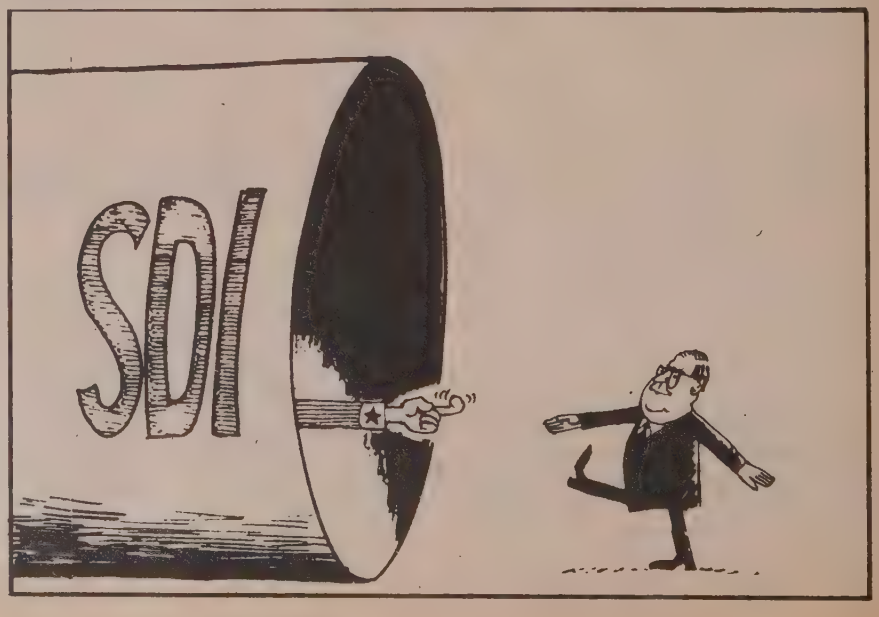
This is a funny story, but it would be risky to build present-day policies on medieval ruses.

SDI: a version for the Old World!

There has been no windfall of U.S. contracts. Their total value is not in excess of several tens of millions of dollars, a mere pittance for Western Europe. Prospects for the future are far from rosy. In mid-May 1987, the U.S. House of Representatives prohibited the use of SDI funds for contracts with foreign firms or governments if similar work could be done by American firms for comparable sums of money. Reuters wrote that such a protectionist measure "could seriously affect foreign governments and companies hoping to win some of the billions of dollars appropriated by Congress for the project."



Washington makes lavish promises to allies, but the promises turn out to be mere crumbs.



Having consented to cooperate with the U.S., European firms had reduced their role to that of subcontractors, the Belgian Le Soir wrote. Big industrialists, naturally, want a larger role. So they have recently been following the development of another idea—the European Defence Initiative with keen interest.

However paradoxical this may seem, it too was advanced by the Americans. Late in 1983, a commission appointed by the President of the United States and headed by Professor Fred Hoffman made public a plan whereby the United States is to design a large-scale anti-ballistic missile system with space-based elements, while West Europeans take part in creating a ground-based anti-missile belt in their territories. About 1,000 U.S. Patriot missiles are proposed as the main links in the belt.

The F.R.G. and the Netherlands signed such contracts some years ago. Washington is now out to foist them on Belgium and others allies.

Today U.S. Patriot missiles are sold as air defence complexes. But what about tomorrow? "After two decades of development intended to make it the U.S. Army's frontline anti-aircraft weapon, the Patriot missile system is being transformed to be able to shoot down Soviet missiles," The New York Times wrote.

F.R.G. Defence Minister Manfred Wörner proposed the West German version of EDI to his colleagues in December 1985. The anti-ballistic missile system was intended to hit missiles and planes by using the latest in military technology, including laser weapons and electromagnetic guns. Publications in the magazine Der Spiegel (F.R.G.) then revealed that a number of West German munitions manufacturers had started developing the programme way back in late 1982.

Experts from the Washington Centre of Foreign Policy Research estimated the overall cost of a West European ABM system at $160 billion. Munitions tycoons in the Old World covet so big a deal, with Washington adding fuel to the flames. An example was furnished by a speech by the director of the SDI programme Lieutenant General James Abrahamson over the television link-up between Washington and a number of West European capitals in November 1986.

The American general said he was pleased with the progress made in solving the problem of intercepting theatre missiles, posing as they do "a threat which concerns all our allies in Europe." He confirmed the United States' readiness to share this technology with its partners if they start building a West European ABM system.

A new bone was thrown to the allies in December. On arriving for a winter session at the NATO headquarters in Brussels, U.S. Defence Secretary Caspar Weinberger held a news conference and announced the appropriation of $14 million for the joint development of the idea of a West European ABM system. This lean bone attracted 51 firms, 29 of them West European. When he stopped over in London, Caspar Weinberger offered the allies five other contracts for research within the framework of the Strategic Defence Initiative. Three of them are relevant to EDI. The total value of the package offered in London was $8.7 million. As compared with the immense cost of SDI and its European appendage, the contracts offered by the U.S. look meagre indeed, particularly when shared out among all the participants.

The F.R.G. Defence Ministry is vigorously promoting the idea of creating an anti-missile belt in Western Europe. The tremendous pressure is starting to bring results.

This was patently illustrated at a conference in Paris whose substance was succinctly summed up in its title: "Allied Defence Industry Cooperation: SDI and Beyond." Big industrialists and bankers, military experts and officials took part in it. The question of EDI came up for discussion more than once. It was specifically touched upon by the vice-president of the French Thomson corporation, François Heisbourg. He said West European countries should replace U.S. Hawk missiles, which now constitute the backbone of their air defences, with missiles of their own makes. And the new weapons should be able to shoot down not only aircraft but also missiles. In other words, Heisbourg was calling for the creation of a West European anti-ballistic missile defence under the pretext of upgrading air defences. He emphasized that such a system should be created with the resources of West European industry with minimal participation by the Americans.

It is not only Heisbourg who avoids calling a spade a spade. The promoters of the West European ABM system discarded the term EDI for the reason that the U.S. programme is too unpopular in the Old World. "As soon as you relate anything to SDI, some nations don't want to talk about it," a certain high-ranking military official admitted in an interview to a correspondent of NATO Report. This is a significant detail.

Another meeting of a group of leading experts from NATO member countries was held at NATO headquarters early in May 1987. Details of a preliminary report on EDI to the May session of NATO defence ministers were discussed. The final decision of the heads of the military departments on this problem will apparently be adopted at a conference in December. The United States is represented in this group by the chief of a Pentagon department, Donald Fredericksen. He said the U.S. proposed the creation of EDI on the basis of U.S. Patriot missiles, which were being modernized. And he stressed that the U.S. was prepared to take part in drawing up a joint project with its allies.

The discussion in Geneva of the elimination of Euromissiles and shorter-range missiles cuts the ground from under the feet of EDI supporters. "There's the possibility," one informed source at NATO remarked to NATO Report, "that missiles we want to intercept may not exist in six months. Nevertheless the examination will continue on the basis of existing conditions."

Effort to remove obstacles to SDI

The plans being discussed in the U.S. to deploy the first tier of SDI and adjust the Treaty on the Limitation of Anti-Ballistic Missile Systems accordingly caused serious anxiety in the Old World. It was reported in the press that West Europeans feared that the Americans would undermine the treaty and blast any hopes for elaborating disarmament agreements. Hardly anyone in the Old World is attracted by the prospect of an unrestrained and unpredictable arms race. Its leaders have stated that plainly enough.

F.R.G. Foreign Minister Hans-Dietrich Genscher sent Washington a dispatch urging it not to undermine the existing arrangements. Léo Tindemans, his Belgian counterpart, visiting the U.S.A. in his capacity of current President of the EEC Council of Ministers, told U.S. Secretary of State George Shultz that the West European allies held that research used in the SDI programme should not overstep the ABM treaty in its traditional interpretation. Criticism was voiced in Amsterdam, Rome, and other allied capitals.

Initial attempts to dismiss the "panic-stricken" partners have not eased the tension. NATO Secretary-General Lord Carrington sent Washington another demand not to make any decisions

without consulting the allies. Meeting journalists, British Prime Minister Margaret Thatcher thus formulated the message to the United States: "Please consult your other allies in NATO on this matter of vital importance to us all."

Washington answered public requests with a public rebuke, and advice not to meddle. The Europeans do not like the broad interpretation of the ABM treaty, said director of the U.S. Arms Control and Disarmament Agency Kenneth Adelman. But this is our agreement with the Soviet Union, he said. "I really don't think they have any qualifications for telling us what is the right interpretation of the ABM treaty."

Washington's plans to deploy the first tier of SDI and its encroachments on the ABM treaty have put the allies in an awkward position. Joining SDI and wishing to save face, they emphasize that what they mean is only joint research and they invariably add that in Camp David in December 1984 Margaret Thatcher and Ronald Reagan reached the understanding that work on SDI would be within the limits of the ABM treaty and that talks with the U.S.S.R. and consultations with the allies must precede the deployment of any elements of the programme.

Hardly a year had passed when Washington started talking about a "broader" interpretation of the ABM treaty, which allegedly allows for space tests and even the creation of some components of SDI. Not wishing to antagonize them unnecessarily, the Reagan administration decided to adhere to the traditional interpretation of the treaty for a certain period of time. In January 1987 Caspar Weinberger and other influential advocates of "star wars" plans declared that that period was running out and that it was time to adopt a decision on the deployment of the first tier of SDI and on the fate of the ABM treaty.

How will the West Europeans behave? Judging by the sentiments in the U.S. Congress, their firm stand and refusal to participate in the militarization of space could check the implementation of the "star wars" plans. But the indications are that Washington views this prospect as fairly unlikely, believing that they will make a fuss and then calm down, as they have done more than once in the past.

Take the SALT-2 treaty. At the spring session of the NATO Council in 1986, the U.S. President announced the intention to overstep the limits set by the treaty. This sparked off a bitter polemic that was not very pleasant for the U.S. administration. Six months later, at the winter conference of the alliance, held a fortnight after the United States exceeded the SALT-2 limits, that issue was no longer a priority. The Western press wrote that criticism had been toned down for the sake of NATO unity. Moreover, after a series of U.S. explanations and consultations, some West European leaders started talking about the need for both sides to comply with the provisions of the SALT-2 treaty, as if the Soviet Union had also overstepped it. But Moscow has not violated the provisions of the treaty, its quantitative limitations, said former director of the U.S. Arms Control and Disarmament Agency Paul Warnke. It is the United States that has this dubious honour, he added.

White House emissaries Paul Nitze and Richard Perle set out late in February on a West European tour with a stopover at the NATO headquarters in Brussels. Washington finally decided to observe the proprieties with regard to the allies and "consult" them, just as on the SALT-2 treaty in the past. But the consultations have not resulted in any fundamental changes in the U.S. stance or policies. The debates in the U.S. have merely been toned down for the time being. Washington persists in its effort to remove all obstacles to SDI. ■

F.R.G. Defence Minister Manfred Wörner, one of the authors of EDI. U.S.-made Patriot complexes—the first step towards the implementation of the Bonn plans.

YURI TAVROVSKY

FLOUTING THE CONSTITUTION IN THE INTERESTS OF DEATH MERCHANTS

"The goddess of fortune looks only forward, not back," Teruo Hiruma, the smiling energetic president of the Hamamatsu Photonics concern, repeated this saying several times as he spoke of the achievements and plans of his company. And indeed it owes its success to a constant search for the new—among the many samples of the firm's output he showed us newsmen were unique vacuum tubes capable of detecting the minutest particle of light and powerful vidicons which convert videocamera images into signals for computers.

"We specialize in qualitatively new technology, sometimes doing what in other countries is considered impossible," the president continued. "Our American opticoelectronics competitors, for instance, are strong in theory and basic research, but when it comes to production.... It is not surprising that promoters of the SDI programme are so interested in our output. Do we want to participate in SDI? You see, we are engaged in business, not in charity. So we sell our goods to any buyer. The Americans clearly need our vidicons for their missile guidance systems. In principle I am against war, against killing people. But after all, SDI holds out the promise of long-term advantage...."

Unlike the president of this small firm in the Shizuoka prefecture, many prominent Japanese businessmen and politicians are not at all convinced of the long-term, or even short-term benefits of participation in "star wars." The question is still being debated, even after the Nakasone government's decision to join in SDI research.

Unanswered questions

That decision, announced on September 9, 1986, had not been easy to take. The leading opposition parties—the Communist, Socialist and Komeito (Clean Government) parties—categorically objected. Within the ruling party, too, there were those who called for circumspection and caution. Among them were, for example, Shintaro Abe, a prospective candidate for the premiership and until recently Minister of Foreign Affairs, as well as influential members of the Liberal Democratic Party Zenko Suzuki and Takeo Miki, both former prime ministers. Two thousand prominent physicists and 700 mathematicians and programmists working with them refused to have anything to do with projects connected with "star wars." Why, then, did the government accept the American invitation to join in SDI?

One of the arguments in favour of involvement, now current in Tokyo, is that SDI is a highly sophisticated defence system allegedly not pivoted on nuclear weapons. To expatiate on the fallacy of this contention would be to question the intelligence of New Times readers.

Another argument is connected with the "special relationship" between Japan and the U.S.A. Consent to take part in SDI could, it is held, cool the passions aroused by the growing imbalance in the two countries' bilateral trade. Can one agree with this? Hardly. After all, these passions are running high primarily among private firms and corporations which are losing one trade war after another and have nothing to gain by Japan's involvement in the "star wars" programme. For the White House and Congress the strategic value of Tokyo remains the main consideration even if the trade deficit runs not to $60 billion, as last year, but to $160 billion. Incidentally, another argument in favour of "star wars" participation also has a bearing on strategy. It is claimed that refusal to participate would be tantamount to terminating military cooperation, which, along with the huge volume of trade, has until now tied Japan to America. This argument is probably more weighty than the preceding.

But those Japanese political analysts are probably also right who see in their country's economic and military dependence on the United States only half of the overall picture of interdependence. For it is not because of interest in the tea ceremony or the Kabuki theatre that U.S. companies buy hundreds of billions of dollars' worth of Japanese goods, but because they need these high-quality and reliable products which they are not able to produce themselves at home. Moreover, what other country has so much surplus capital to invest in the U.S. with its astronomical budget deficit? Or what other country in Asia would agree to play the rather dangerous role of an increasingly active participant in American nuclear strategy or of an "unsinkable aircraft carrier" and a source of unceasing provocation against a neighbouring nuclear power? In the light of these and other aspects of interdependence, it might be assumed that had it wished to, Tokyo could have safely refused to take part in "star wars." It could if it had wished to.

Given that desire, it could have produced the appropriate arguments. For example: a Japanese-American intergovernmental agreement on cooperation under the SDI programme would be the first document officially confirming Japan's participation in strategic military cooperation with the U.S., with all the equally strategic consequences this would entail. Further, Japan's involvement in the dangerous game of global strategy clearly runs counter to the security interests of this great commercial and industrial nation living on four relatively small and vulnerable islands.

Participation in SDI also conflicts with the views on the present and future of Japan held by the adherents of the so-called Yoshida School in the LDP. Ever since the Liberal and Democratic parties merged in 1955 to form the LDP, there have been two trends, two "schools" in its leadership. Prime Minister Shigeru Yoshida led the proponents of placing the emphasis on economic development with moderate spending on armaments. Another premier, Nobusuke Kishi, and his followers advocated repealing the Constitution with its anti-war clauses, rearming the armed forces and acquiring the status of a military-economic superpower. The rivalry between these two "schools" continues to this day. The year and a half stalemate on the SDI issue was evidently due to the existence of a rough balance between them. But after the impressive victory of the followers of Kishi, who is still going strong, in the "double election" of 1986, the balance shifted in their favour. Overcoming the resistance of the Yoshida "school" they mounted their long-planned counteroffensive.

The Kishi group is well aware that involvement in the "star wars" nuclear missile programme conflicts with the Constitution, its three non-nuclear principles, the parliamentary resolution of 1979 on the peaceful use of outer space, and the commitment not to export arms. Nevertheless, they openly stand for relaxing or, better still, altogether discarding the "postwar taboos." A no less important objective is to use SDI as a cover for embarking on the creation on the quiet of a Japanese nuclear missile potential and building up a full-fledged military-industrial complex.

The tip of the iceberg

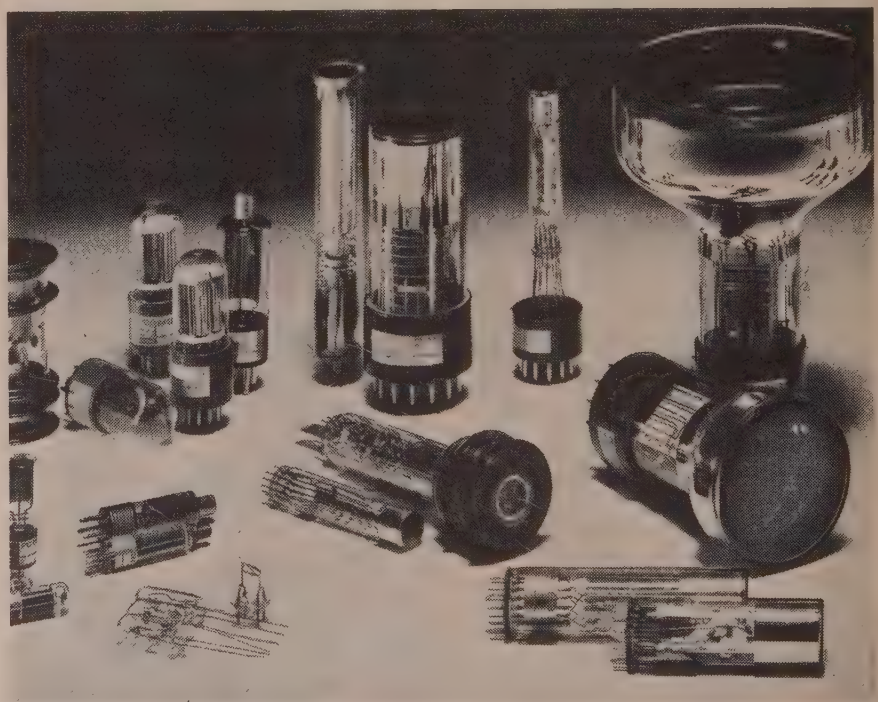
War industry, like many other things in Japan, has two aspects—the visible and the invisible. What is visible is quite modest on the face of it: by the 1983 fiscal year the volume of its production amounted to 1.11 trillion yen ($6.4 billion at the exchange rate of the time), which was less than half of one per cent of the GNP, or slightly more than four per cent of the value of the output of the automobile industry. Practically none of the country's biggest corporations produce military technology exclusively or depend to any substantial extent on orders placed by the war department. The 2,300 firms registered as suppliers to the Self-Defence Forces are mostly medium-sized or small companies. True, there is the so-called Big Five—Mitsubishi Heavy Industries, Kawasaki Heavy Industries, Mitsubishi Electric, Ishikawajima Harima, and Toshiba—which together receive about two fifths of all military orders.

Visible, too, are these facts: the Japanese war industry supplies more than 90 per cent of the materiel, ammunition and equipment needs of the army, the navy and the air force. It has designed and put into production the F-1 supersonic ground support jet, the Typ-74 main battle tank with a computerized gunsight and a laser range finder, the Typ-80 air-to-ship guided missile and Typ-81 surface-to-air guided missile and the SSM-1 cruise missile. All the navy surface ships and submarines, including missile-carrying submarines, helicopter-carrying anti-submarine frigates and guided missile destroyers have been launched at Japanese shipyards. An important role in the development of the war industry is played by the use of American licences, specifically in the production of F-4E and F-15 jet fighters, P-3C Orion anti-submarine planes, and missiles of various types.

However, the full strength of the Japanese war industry is not confined to this. The visible tip of the iceberg rears over the "underwater" part of the economy. As distinct from all other industrial countries, Japan develops its most advanced technology as a rule in the laboratories and research centres of firms producing consumer goods, from where it is transferred to military production. A classical but by no means unique example is the use in the manufacture of the fins as well as the fuselage of jet fighters of special plastics originally developed for use in the manufacture of highly durable fishing rods.

Concentration on areas promising quick returns, cutthroat competition, generous financing and emphasis on quality have enabled the producers of Japanese consumer durables to overtake and in some cases outstrip researchers and engineers of the U.S. and West European countries where jealously guarded trade secrets lead to a great deal of scattering of effort.

The advanced technology accumulated in civilian branches can at any moment be placed at the service of the war industry. The same applies to production capacities, which, according to estimates by Japanese economists, could already now meet the demand



Those connected with the SDI programme in Washington keep a close eye on the latest developments in Japanese high technology.

on the world market for about 60 per cent for warships, 40 per cent for warfare electronics, 46 per cent for military transport facilities and about one third for aerospace output. As Masanori Tabata, military analyst of the Japan Times, aptly observed: "a sort of military-industrial complex has already grown into a political reality just like in the other industrial powers of the West."

A reality indeed is the increasingly marked merging of the interests of the professional military, the industrialists reaching out to new spheres of production and new government appropriations, and also the interests of the politicians who speak in all seriousness of "Japan's right to world leadership." There is also the opposite political reality. The Yoshida "school" has some support among top business executives who hold that gearing the Japanese corporations to war production in the nuclear age is not only too dangerous but also highly unprofitable as regards income, expenditure of raw material and intellectual resources, especially as compared with the highly competitive production of automobiles, video tape recorders, personal computers and electrical household appliances. It looks as if the rough balance which until recently existed between these two political realities will be upset by SDI.

The new stage in the development of the Japanese military-industrial complex will in all likelihood begin with integration with that of the United States. Cooperation between the war industry concerns of the two countries has a long history—it dates back to the time of the U.S. aggression in Korea in 1950. That industry became firmly established as the result of another Asian war waged by Washington—against Vietnam, Laos and Cambodia. In recent years bilateral agreements have been concluded not only on licences and sales, but also on joint development of one or another type of military technology.

The "senseis" make concessions

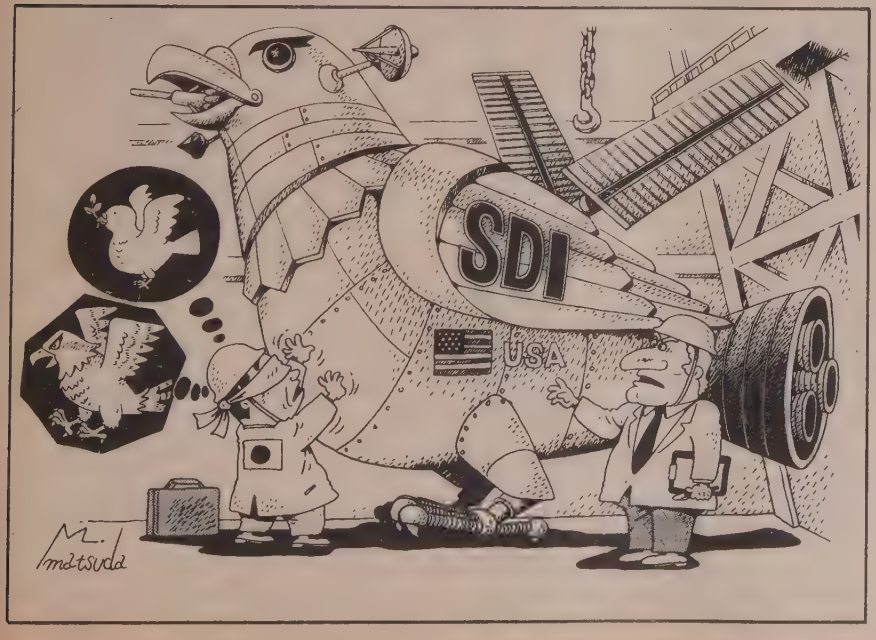
Until quite recently Japan's American partners invariably acted as "senseis," or mentors. The Japanese-made F-15s are twice as reliable as their American prototypes, yet the "black box" formula fire control system and airborne computer, "the brain and the eye of the fighter plane," still come from the United States. The Japanese aerospace industry has never had a fiasco such as the Challenger catastrophe, yet the rockets launched and satellites orbited from Japanese airdromes still contain many important components and systems made in the United States.

True, today there is a definite tendency to reduce dependence on the "senseis" even in spheres where their technological superiority was unquestionable a few years ago. An important milestone for the Japanese space industry will be the year 1992, when the H-II launch vehicle, the first to be wholly designed and built in Japan, is to blast off. Indicative of the dimensions of Tokyo's space plans is also the decision to begin the development of a Japanese shuttle. This space vehicle of original design is to be ready early next century.

Juko Kurihara, head of Japan's Defence Agency, is one of those who would like Tokyo to take part in Washington's star ventures.

As regards the aircraft industry, which besides the space and electronic industries attracts the attention of foreign observers, here the final decision on the future of the next generation FSX fighter plane will be crucial. The Japanese aircraft designers, whose famous Zero fighter planes gave American pilots so much trouble during the last war, have independently built only one military (F-1) and one civilian (YS-11) plane since 1945. Not long ago they again drew attention to themselves by their active and successful participation in the development of the Boeing 767. The Mitsubishi, Kawasaki and Fuji firms got 17 per cent of the orders, mainly for fuselage parts. The same firms are now taking part in the designing of a new Boeing. This time they are doing 25 per cent of the designing. But it is in the development, wholly or in part, of the FSX fighter that these and some other firms are out to make their mark. The U.S. and West European governments, which are anxious to reduce their trade deficit with Japan, are strongly opposed to this. The U.S. is offering to sell Japan an improved modification of the F-18 jet fighter and the West Europeans, Tornado fighters. The Americans promise to equip the F-18s with supermodern CCV (control configured vehicle) technology which makes it possible for the aircraft to move up and down and turn left and right without changing the direction of the nose section, and also make it invisible on the radar screen. The object is to preserve the "interchangeability" of American and Japanese materiel that has emerged in recent years, enabling the

"Easy, man, there's no cause for alarm. Keep your mind on your work."



Americans to count to some extent on using the Self-Defence Forces and their arsenals as a reserve. On the other hand, the CCV FSX prototype, already built by Mitsubishi, is a weighty counterargument.

Nevertheless, despite its obviously impressive achievements, the Japanese war industry cannot seriously compete with the enormous U.S. military-industrial complex. Although they have forged ahead in several areas, the Japanese are not yet able to create complete systems of armaments. As a matter of fact, so far they are quite content even with the role of suppliers to the U.S. of certain materials, components and finished products. After all, this role too is comparatively prestigious and new for companies of a country whose government formally prohibits the export of armaments. That ban actually went by the board in 1983 when, after some casuistic debates, it was announced that the sale of military technology to the U.S. would, by way of exception, be permitted on the basis of the Security Treaty. Even before 1983 the Pentagon obtained from the Kyocera Corporation (through its American subsidiary) ceramic parts for the Tomahawk cruise missiles and also magnets (produced by the American subsidiary of Hitachi) for lasers designed for use under the SDI programme. The latter two examples are especially noteworthy as an indication of the Pentagon's heightened interest in the achievements of the civilian part of the Japanese military-industrial complex—"dual purpose" technology. For instance, the same printed circuits can be used for both a children's videogame and for the electronic "brain" of an intercontinental missile.

At the present time about four fifths of the silicon chips used in the U.S. armed forces' electronic systems come from Asia, staff members of the House Armed Services Subcommittee recently noted with alarm. It is not only a matter of silicon chips in respect of which the U.S. has become "captive of the Japanese," to quote Robert Cooper, former Assistant Defence Secretary. The fact is that microelectronics, optical fibres, new materials and laser technology are becoming critically important for many of the Pentagon's programmes. "Japan today has the technology base to be a major supplier to the SDI," Richard Reynolds, director of a department of the Defence Advanced Research Projects Agency, adds. The need for Japanese supplies is so great that the directors of the "star wars" programme are obliged to make substantial concessions to Japanese firms. For example, an important exception has been made for them from the rule that all participants in the programme, and especially foreign firms, must sign a special undertaking to preserve secrecy.

Who stands to gain

But however great the interest in Japan's participation, whatever the privileges the pioneers of the Japanese military-industrial complex have wrested for themselves, the fact remains that the principal benefits from the "star wars" will be reaped by the U.S. military monopolies—in terms both of money and technology. "Anyone who thinks that taking part in the SDI programme will give Japan better access to U.S. technology is being quite naive," says Asahi Shimbun. "Almost all kinds of military technology are top security affairs. And finally there is no guarantee that the programme will allow Japan to utilize the results of joint research with the United States." Even more categorical is the prominent Japanese physicist and member of the Japanese parliament Husimi Kodi. "The United States," he says, "may scheme to monopolize the fruits of SDI, leaving its allies out in the cold. The Manhattan project is a good example of how this happened before." In its early phase, he continues, British and French scientists were mobilized to help the United States, but on the eve of the bombing of Hiroshima and Nagasaki many of these foreign scientists "were cast out of the project...." And the Japanese political scientist Takase Shoji, writing in the Japan Quarterly, goes to the root of the matter: "SDI is a massive technological information network to be controlled and commanded by the United States in the 21st century. The control of this network is much more valuable than any projected, still doubtful military advantage that SDI may provide."

Thus we see that Japan is fully aware of the political essence of the Strategic Defence Initiative, the purpose of which is not only to ensure the military superiority of the U.S. over the Soviet Union and economic "exhaustion" of the latter, but also the "strategic defence" of the U.S. economy, science and technology against increasingly successful competition from its Japanese and West European allies. Nevertheless, Japan has decided to become involved in this far-reaching scheme designed to swallow up the military-industrial complexes of other countries involved in the "star wars" programme.

Why? One gets the impression that the bellicose politicians and the other members of Japan's military-industrial complex are ready at this stage to put up with any financial and technological losses for the sake of obtaining a pretext for engaging in research, testing and production of a military technology qualitatively new for Japan. A technology which in the foreseeable future will enable Tokyo to raise the question of its own "star wars" programme.

One can only marvel at the shortsightedness and short memory of the U.S. leaders who not so long ago suffered heavily in collision with the Japanese war machine. At the present time they are gloating over the anxiety of the Soviet Union, China and other of Japan's neighbours over the latter's decision to take part in SDI. But let them beware lest the Dame Fortune turn her back on them.

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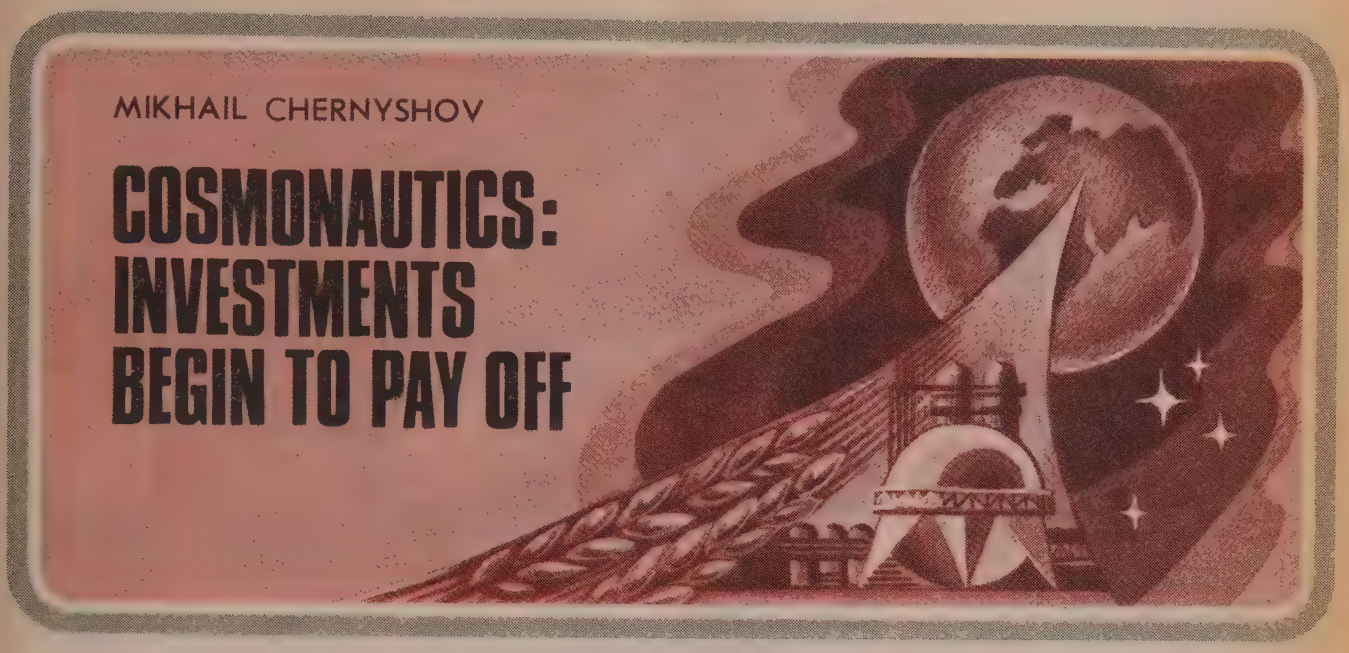
MIKHAIL CHERNYSHOV

COSMONAUTICS: INVESTMENTS BEGIN TO PAY OFF



Near-earth orbits have long been a habitual field of operations for many types of spacecraft. In the years since the start of the space era the Soviet Union alone has launched more than two thousand space vehicles of various designations. Manned orbital stations pioneered by the Soviet Union play a tremendous role in carrying out scientific and economic tasks.

The age of discovery continues

In the mid-17th century the Cossack Yerofei Khabarov, together with other Russian explorers of new lands, set out on an arduous journey to the eastern tip of the Eurasian continent to "chart the course of the river Amur." Today passengers on board an airliner flying between Moscow and Khabarovsk know that the age of the great geographical discoveries is long past and for this reason only occasionally glance absent-mindedly through the portholes at our planet as it glides past beneath them.

Yet at exactly the same time the orbital station Mir streaks high overhead, taking 90 minutes to span the distance that Fernando de Magellan, the famous navigator, covered in three years. And with everything they do the crew of Mir refute the claim that the age of geographical discoveries is over.

Of course, it could appear that today it is impossible to discover from outer space as much as a new stream, let alone a new Amur. But that is not so. The atomic-powered icebreaker Sibir has just forced its way through ice to the North Pole. Incidentally, it was assisted in this by Soviet weather satellites. With the help of pictures taken from outer space, the icebreaker plotted the optimal course through the formidable ice. One of its tasks was to help chart geographical maps of polar areas, in more detail. Space pictures of Soviet archipelagos in these regions show small, little-studied islands that do not have even names. The expedition will study them more closely and name them. But the credit for discovering these islands goes to cosmonautics.

But, generally speaking, few people know how short-term maps really are. Earthquakes, volcanic eruptions, other natural processes and human activity make many types of map obsolete within four or five years of being compiled. So they have to be updated, but the work of cartographers is often almost Sisyphian: a map becomes obsolete almost as soon as it is published. Practice shows that space technology is particularly efficient in many areas of cartography.

Looking at earth science programmes carried out by Soviet orbital stations as a whole, it soon appears that cartography accounts for only a fraction of them. The crews of space stations fulfil orders for farmers and fishermen, geologists and town planners. Along with specific applied assignments, cosmonauts also carry out research. Their aim is the creation in the future of a space-based earth science system that will keep a record of key natural resources, help plan their rational use and monitor the purity of the natural environment. Artificial satellites will do most of the work for this future system.

More than a thousand organizations in the U.S.S.R. now use information supplied from outer space in their daily work.

Some estimates show that states investing in the space-based earth sciences have already recouped to the tune of from $20 to $50 billion. It may well be that in the future cosmonautics will make it possible to advance to the next stage — the controlled development of natural systems. True, this will still require a great deal of time but the first steps are already being taken. Together with scientists from other socialist countries, Soviet specialists are working intensively within the framework of the Intercosmos programme on systems for the space monitoring of farm crops. It has been estimated that at the present stage this saves Soviet agriculture up to 50 million rubles a year. Each ruble invested in space-based earth sciences, it is believed, can bring a 17-fold profit.

Nor should one discount the indirect advantages of space-based earth sciences. For example, at one time Bulgaria imported the expensive spectrometric equipment used in remote probing. By taking part in the Intercosmos programme Bulgaria became a manufacturer and exporter of such equipment. The G.D.R. enterprise Carl Zeiss Jena has also considerably increased its export sales by manufacturing instruments for space-based earth science research. Such examples are numerous.

Commercial space and new technologies

American economists have estimated that the commercial side of the space activity of all the member countries of the "space club" will have a market worth $52 billion by the end of the century. New technologies will account for a considerable part of this market.

In the U.S.S.R. space technology originated in 1969, when the first experiments to weld metals in conditions of weightlessness were conducted on one of the manned spaceships. Today some fields of space technology have approached the point beyond which industrial production should begin. This, of course, did not come about of itself. Experiments were staged on an increasingly large scale and using more and more sophisticated equipment. A particularly impressive amount of work was performed on board the orbital station Salyut-6 in the period from 1978 to 1982. During that time cosmonauts effected some 200 smeltings of various materials. Cosmonauts delivered about 300 samples of their space produce to earth and some of them were used even then in the production of computers and optical devices.

A semi-industrial installation for the cultivation of large high-quality crystals was first used on board Salyut-7. The experiments to produce superpure biological preparations proved sensational. Experiments showed that the process of purifying protein in conditions of weightlessness is hundreds of times more effective than on earth and the degree of purification is 10-15 times higher. The first batch was used to produce the so-called standard anti-flu vaccines. Since then a number of other preparations for medicine, as well as the needs of the microbiological and food industries, have also been produced on board Salyut-7.

A television screen the size of a wall, a video tape recorder of a quality superior to present ones, "intelligent" robots, new electronic computers using superbig and superfast microcircuits — in the near future cosmonautics will start helping the electronics industry on earth to create all these and more. The assembly lines, naturally, will still be on earth, but the most complex components—semiconductor crystals of impeccable structure—will be supplied by production shops operating on near-earth orbits. Metallurgists, opticians and doctors are now pinning great hopes on space technology. The possible range of products is also being specified—several hundred different materials that it is expedient to produce in outer space. Yet many specialists forecast that it is electronics that will be the first area to operate on an industrial scale in outer space. Moreover, there are already some practical results. On board Salyut-7 some of the semiconductors have been used in specific equipment—the crystals were used in a laser TV projector and various photo receivers. All these semiconductors were grown in the installation Korund. Subsequently this installation was modernized and the Korund-1M model is now functioning on board Mir. Cosmonauts Yuri Romanenko and Alexander Laveikin used it to carry out a major research programme involving dozens of experiments.

After the cosmonauts have charged the containers with samples, the furnace can operate automatically, as smelting process is controlled by an electronic computer. The furnace can produce ingots 25 millimetres in diameter and up to 10 centimetres in length, the range of smelting temperatures being from 200 to 1,200 degrees C. In fact, Korund-1M is a prototype of the technological equipment that will be used in production modules.

True, solutions to some problems of industrial technology in space remain outstanding, the problem of energy being one of them. The output of semiconductors in large batches requires a considerable amount of electricity—tens of kilowatts. By terrestrial standards this is trifling, but to maintain a stable supply of such quantities of energy in outer space it is necessary to build big solar panels—energy fields—or have other powerful electricity generators. All this also requires additional experiments. So the purpose of the research carried out on board Mir is to provide answers to this set of questions.

The Soviet Union cooperates extensively in space technology with other socialist countries, while a number of programmes have been carried out in cooperation with France and India. The crew of Mir uses the special installation Pion to study the subtle effects of weightlessness. At the same time, in conjunction with scientific institutions in Czechoslovakia, Poland and France, Soviet specialists are attempting to create more advanced onboard installations that will sustain the regimes necessary for smelting and the growing of crystals.

Two concepts of space exploration

For several years now Western experts have been comparing the Soviet and American space programmes. A new pretext for this was given by the U.S. administration's decision in 1984 to start designing a big orbital station.

Among the merits of the Soviet space programme many specialists have always noted its thoroughness and the fine balance of the main components: manned flights, development of satellite systems, studies of the planet and distant space. A number of reliable carrier rockets have been designed, for instance Kosmos, Soyuz and Proton, capable of performing most diverse transportation tasks. Yet another, and very powerful, booster rocket has lately appeared — the Energia. With a launching weight of more than 2,000 tons this two-stage rocket can carry a payload of more than a hundred tons. Its uses are diverse, i.e., it can lift heavy sputniks, modules for orbital complexes and shuttle ships. Incidentally, Soviet specialists do not exclude the possibility of creating shuttle spaceships, as these could be more effective for the performance of certain tasks than the existing transport systems. But orbital stations remain the core of the Soviet programme. The Soviet orbital station seems fully adapted to the U.S.S.R.'s long-term plans, the American press has written, while the American one is more in line with the philosophy of space spectaculars.

In developing the main technical components on which its space programme is based, the Soviet Union is gradually solving increasingly complex problems. In this sense the path of American manned flights is a more tortuous one. After the first manned flights in near-earth space, the United States concentrated all its efforts on the Apollo programme — the landing of men on the moon. Then came brief spells of work on board the Skylab orbital station, after which the development of the shuttle, a multipurpose spaceship, was started. Manned flights were suspended for several years. The need to create shuttles was based on the premise that these ships will substantially reduce spending on the delivery of payloads to orbit and that this will create major opportunities for using outer space for research and commercial purposes. But as soon as the shuttles were created they were abruptly switched to military programmes. No reduction in transportation costs materialized. Moreover, as American scientists repeatedly predicted, the shuttle programme gobbled up all the allocations for research projects. The Challenger tragedy, which claimed the lives of seven astronauts, further exacerbated an already difficult situation.

It appears that the project to create a big orbital station is mirroring the fate of the shuttle. It was planned to

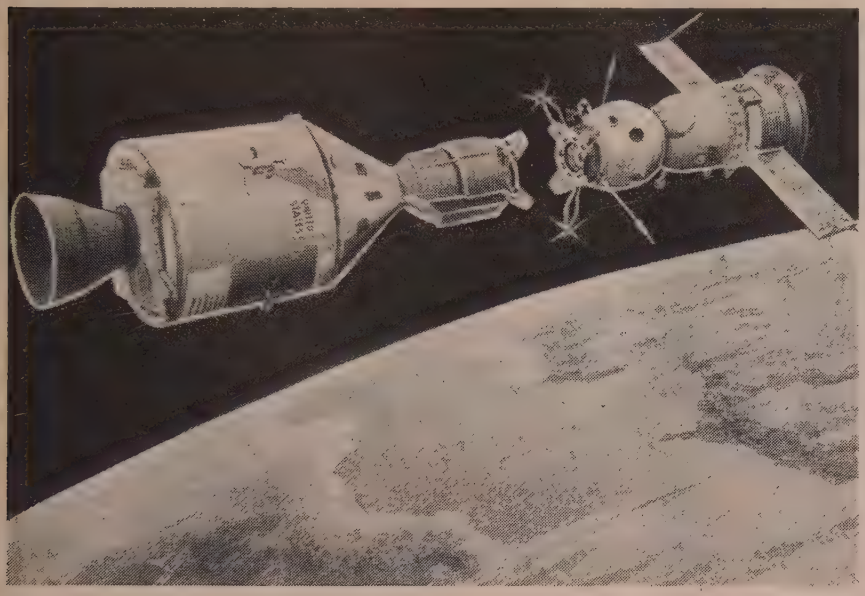
launch it in 1992-93 and assemble it from four or six modules. From six to eight astronauts would have lived and worked in the station for a period of up to three months, after which a new crew would arrive. The station was expected to have purely commercial functions — to produce semiconductors and medicines in weightless conditions, service and repair satellites and, in the distant future, serve as a starting point for flights to the Moon and Mars. The European Space Agency, Japan and Canada expressed readiness to join the project.

But then events took a different turn. If we are to believe the American press, at first the Pentagon had not shown any particular interest. The project was revised several times and the cost assessment was changed: at first it did not exceed 8 billion dollars, while now sums of 12 billion dollars and more are being quoted. The launching date has been postponed till 1996, and the station has been reduced to two modules. But that is not the main thing. As evidenced by the American as well as the West European press, the Pentagon is "changing its attitude" to the station and beginning to regard it as a potential platform that could be used for refuelling and repairing "star wars" weapons, and converting space debris — space vehicles that have completed their service life—into decoy targets. It is also intended to use the station for intelligence operations and battle management in the event of hostilities.

Military objectives are pushing both the commercial use of outer space and fundamental research into the background and erecting barriers of secrecy in relations with partners. The already strong tendencies towards autonomy in the European Space Agency and Japan in the fulfilment of their programmes are being reinforced. In a recent speech Ronald Reagan said the space station would be America's gate to the Universe and serve as a cornerstone of its space programme, a base camp that would help in launching flights to other planets and at some future time perhaps even to the stars... But very soon after these words were uttered it transpired that the new gates open onto a road that leads nowhere, that of "star wars."

In its initial version, the project for a big orbital station was obviously adopted in the light of the U.S.S.R.'s successes in this field. Reagan was in the thick of his election campaign. When announcing the start of construction, the U.S. administration promised to increase employment and win the country leadership in the scientific and commercial use of outer space. Now estimates of prospects in this respect are very pessimistic. The Soviet Union has accumulated a wealth of experience of lengthy space flights. The Americans have nothing that even closely approaches it.

The work carried out on board Mir and, for that matter, on the previous stations, is absolutely open and its



In 1972, the U.S.S.R. and the U.S.A. signed an agreement on the exploration and use of outer space for peaceful purposes. Three years later the Soyuz-Apollo mission—the docking of Soviet and American spaceships in orbit and their joint flight—was carried out. The world welcomed this event, which was regarded as a promising first step. Unfortunately, the U.S. administration has severed contacts with the Soviet Union in this field.

The Soviet programme of space research provides for the participation of all interested countries in joint experiments and manned flights for the sake of peace and progress. Several cosmonauts from various countries have made space flights on board Soviet ships. One of them, Jean-Loup Chrétien, a French citizen (left), went on a space mission together with the Soviet cosmonauts Vladimir Dzhanibekov and Alexander Ivanchenkov.

nature is well known. Eleven international crews have already worked in outer space on board Soviet stations and another three are planning to visit Mir. Moreover, the Soviet-French expedition will be a lengthy one. As new modules are linked to it, the station is gradually building up its research and production potential. In principle Mir can accommodate up to five modules. In that case the total mass of the complex will reach 135 tons. It is expected that the complex will have been completely assembled by 1990. So the Americans, the West European press writes, even if they create their station, will only get what the U.S.S.R. has already had for a long time. The American press goes even further. The New York Times, for instance, thinks the U.S. lag behind the U.S.S.R. in space stations is as great as ten years. The paper sees the reason for this in the policy of militarizing outer space adopted by the United States. The New York Times writes that the Apollo was the last civilian programme of manned space flights to be carried through to the finish.

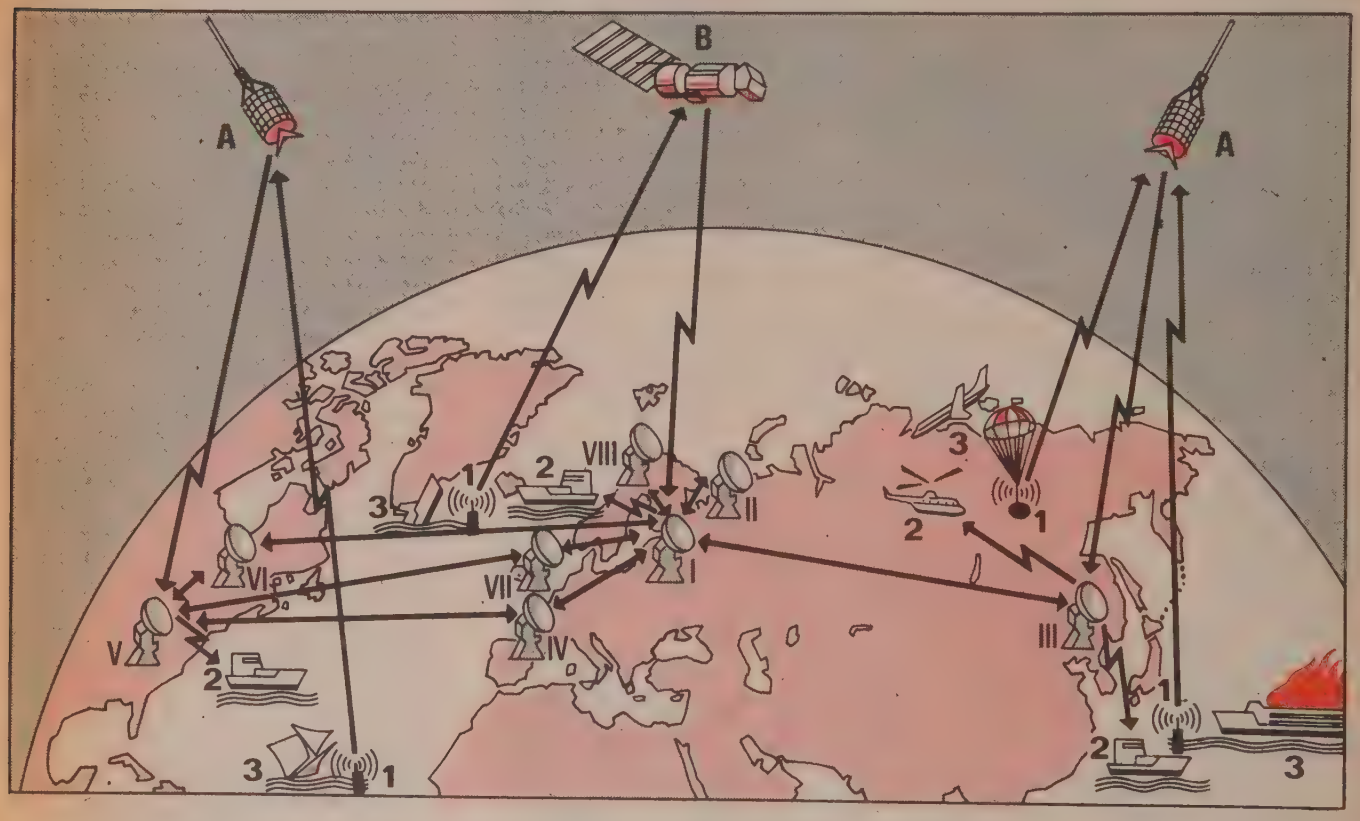
The boom in the communication industry

Over twenty years ago the Soviet Union became the first country in the world to start operating a civilian communication system via satellites. It was based on Molniya sputniks and the network of Orbita ground stations. Today satellite communications are experiencing a real boom. The number of international global, regional and national systems is growing. Experts say that the geostationary orbit will be filled to capacity by communication satellites as early as ten years from now.

Outer space has turned out to be an ideal communication medium in many respects. For the Soviet Union with its huge expanses communication satellites have helped solve major problems of communications and saved large sums of money. It has been estimated, for instance, that the cost of a satellite communication line servicing areas to the east of the Urals is only a third of the cost of a radio relay. But money is not the only consideration. Largely thanks to space technology more than 90 per cent of the country's population can now watch Central Television's first channel, while about 90 per cent, that is slightly less, receives two channels. In the near future it is intended to increase these figures to 100 per cent. There are now about a hundred Orbita stations and several thousand Ekran and Moskva stations in the country. The latter are serviced by Gorizont sputniks. Compared with Orbita, these are small and cheap stations. They are best suited for bringing television to the remote and sparsely populated parts of the country.

The operation speed and range of satellite systems make them advantageous in many areas of communication. These advantages, however, have manifested themselves best in the COSPAS-SARSAT system of rescue satellites established by four countries—

THE COSPAS-SARSAT SYSTEM



A—a COSPAS system satellite. B—a SARSAT system satellite. Satellite information pick-up stations: I—Moscow, II—Arkhangelsk, III—Vladivostok, IV—Toulouse, V—Saint Louis, VI—Ottawa, VII—London, VIII—Tromso. 1—emergency radio buoys, 2—search and retrieval facilities, 3—objects in distress.

the U.S.S.R., the U.S.A., France and Canada. Subsequently it was joined by several others. Thanks to the system more than 600 people have already been saved after air and sea disasters.

Ships save up to 1 per cent of sailing time if they use the marine satellite communication system that has been introduced within the framework of the international organization Inmarsat. It now has a membership of over 40 countries, among them the U.S.S.R.

The Intersputnik international communication system has been operating since 1971 on the basis of Soviet satellites. Work to expand the possibilities of such systems is being conducted by specialists within the framework of the Intercosmos programme. Video conferences, long-distance medical consultations, and data exchange (drawings, documentation) via space are still at the experimental stage. But tomorrow all this will certainly be customary and commonplace. Enthusiasts are predicting a revolution in information technology.

From meteorology to navigation

The Soviet national economy annually saves a billion rubles thanks to the markedly improved quality of weather forecasting using data supplied by satellites. The space-based meteorological system was set up in the country in 1967. At the time four major regional centres were likewise founded to receive and process the incoming information — in Moscow, Novosibirsk, Khabarovsk and Tashkent.

Second-generation Meteor-2 weather satellites have been used by the weather service for over ten years. Unlike their predecessors they can provide running commentary along the route of their flight. The first Meteors stored data in memory banks and transmitted it to earth at definite intervals. The appearance of equipment that transmits information directly without recording it means that many ships and aircraft now have a sputnik's-eye view of the actual meteorological situation for hundreds of kilometres around them. On the whole, two or three satellites in orbit make it possible twice daily to obtain global information on the state of the atmosphere, cloud cover and ice conditions. In the U.S.S.R. this information is supplied to about 90 organizations and 16 ministries. The Meteor-2 sputniks service not only domestic clients but also other CMEA countries. In principle this weather information is open to any state belonging to the World Meteorological Organization, which now has a membership of 157 countries.

It has already been said that satellite communications save ships 1 per cent of sailing time. Another 2 per cent are added by weather information provided by satellites. If such a ship also receives navigation data from satellites, this will save it an additional 19,000 rubles or so a year. This data enables ships to plot their routes more accurately and save both fuel and sailing time. Data provided by navigation satellites is being increasingly widely used by the merchant marine and Soviet civil aviation.

Many of the existing satellite systems in the U.S.S.R. are already on constant duty observing natural or antropogenic phenomena: weather satellites warn of typhoons, earth science satellites report forest fires while Prognoz sputniks detect flare-ups on the sun. The family of observation satellites is growing. Scientists say it is promising to forecast earthquakes by means of space technology. There is data pointing to a link between movements in the earth's crust and ionospheric phenomena: a sort of gigantic piesoelectric effect occurs, causing a glow in the ionosphere. Satellites can register such glows. Experiments in this field have now been in progress in the U.S.S.R. for several years. The future will show if a satellite system will be created for the purpose.

Cooperation in space

The Soviet Union is convinced that the study and peaceful exploration of outer space should be carried out on the broadest international basis. For almost twenty years the U.S.S.R. has given its partners in space cooperation, whether within the framework of Intercosmos or on a bilateral basis, considerable assistance in conducting research, and provided them free with various facilities.

The Soviet Union is prepared to cooperate with all countries in the commercial sphere as well. Recently the Soviet Space Agency (Glavkosmos) offered both states and individual organizations and firms various types of space service: for instance, earth science surveys, launching of special satellites for them, and the staging of technological experiments using Soviet onboard equipment or equipment supplied by the client country. Last but not least, comes the service that is probably in greatest demand today — the launching of communication satellites. The U.S.S.R. is convinced that honest business relations should be maintained in commercial activities in space. This, however, cannot be said of the United States, which is doing its utmost to retain what it thinks is its monopoly position in the commercial space market.

Soviet and American specialists have actively cooperated in many areas of cosmonautics, applied uses among them. The joint work reached its peak in the mid-1970s with the Soyuz-Apollo project. After that cooperation began to be scaled down. All that remains are some studies involving COSPAS-SARSAT, medico-biological and, to some extent, interplanetary research. The "initiative" in scaling down cooperation came from the U.S. administration. Most recently there have appeared signs of a certain revival of joint studies but here, in effect, everything will depend on Washington's stance. If accords are reached barring weapons from outer space, the Soviet Union is ready to cooperate with the United States.

Speaking some time ago in the town of Leninsk, Mikhail Gorbachev said that the Soviet state has already greatly benefited from studies aimed at the peaceful use of outer space. Now the dividends on space activities should be further increased. We must proceed more vigorously from experiments and trials to the planned and large-scale use of existing possibilities in the interests of our socio-economic development.

■

MANKIND'S COMMON PROPERTY

Almost three decades have passed since mankind took its first step into outer space, in October 1957, when the earth's first artificial satellite was launched. The Soviet Union was the first to take this step. "We place our achievements and discoveries at the service of peace and the security of peoples, not at the service of war." These words rang out in Moscow on the day of Yuri Gagarin's flight—April 12, 1961. Since then the Soviet Union has worked unflaggingly to ensure that the boundless spaces of the Universe serve only peaceful purposes and that there should never be arms there.

The U.S.S.R. initiated and today participates in all existing international agreements on the use of space for man's good alone. Our country is a convinced and consistent supporter of broad international cooperation in this new field of science and technology, knowledge and achievements.

In March 1958, the Soviet government put forward the proposal to ban the use of outer space for military purposes. And at the 13th session of the U.N. General Assembly the U.S.S.R. advanced a proposal to discuss and draft international agreements that would define the cooperation of states in the exploration and use of outer space.

A number of new proposals on disarmament problems were advanced by the Soviet Union in 1962-64. They provided, inter alia, for a ban on orbiting or deploying in space carriers of weapons of mass destruction.

On August 5, 1963, largely thanks to the efforts of our country, the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water was signed. This was the first major success scored by all peace-loving forces and the anti-war movement in their struggle to prevent nuclear war and preserve peace. At the same time, in signing the treaty, countries of the East and West had for the first time after years of cold war succeeded in coming to an agreement on a most important issue, one that affected the interests of all the peoples on the planet.

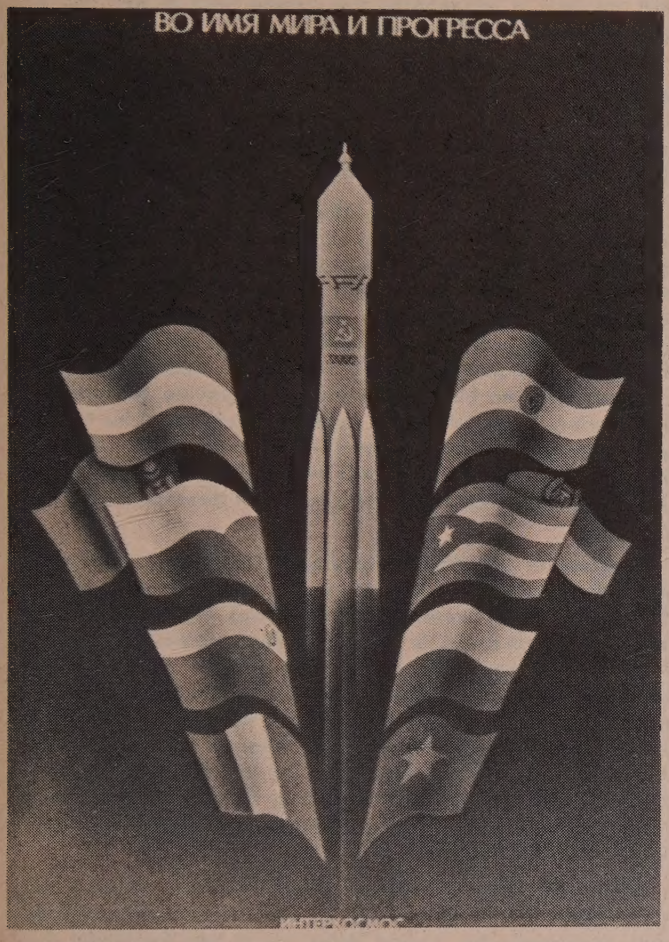
A few years later, on January 27, 1967, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies was drafted and subsequently signed on Moscow's initiative. The first to sign the document were representatives of the U.S.S.R., the U.S. and Britain, and it was then made available for signature to other countries. That treaty laid the obligation on its signatories not to orbit round the earth any objects carrying nuclear weapons or any other types of weapon of mass destruction, not to deploy such weapons on celestial bodies or in space by any other means. Under the treaty, the Moon and other celestial bodies would be used exclusively for peaceful purposes. Later, in 1979, the provisions of this treaty were made more specific and developed in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies approved by the U.N. General Assembly. That, too, was thanks to the Soviet Union.

On May 26, 1972, representatives of the U.S.S.R. and the U.S. signed another highly important document of unlimited duration, the Treaty on the Limitation of Anti-Ballistic Missile Systems. It became the cornerstone of stability, a document that is of key significance in halting the arms race on earth and preventing it in space. The ABM treaty, at the same time, serves as the basis for the transition to universal and complete disarmament. Today it is the main target of those who dream of military superiority over the U.S.S.R. and its allies, and want to see weapons in space. The future of mankind hinges largely on whether or not this treaty remains in force.

And on July 3, 1974, Moscow and Washington signed a protocol to the ABM treaty of principled significance.

> **Our policy of keeping space peaceful is not a sign of weakness. It is an expression of the Soviet Union's peaceful foreign policy. We offer the world community cooperation in the exploration of peaceful space. This is evoking a positive response throughout the world. We are against any arms race, in space included.**
>
> **MIKHAIL GORBACHEV**

On September 28, 1976, the Soviet Union proposed including the question on concluding a world treaty on the non-use of force in international relations on the agenda of the 31st session of the U.N. General Assembly. The draft of such a treaty presented to the world community provided for the renunciation of the use of armed force and any type of weapon, including nuclear, as well as threats to use such weapons, and for all disputes to be settled by peaceful means alone. A year later, on the initiative of the U.S.S.R., the Convention on the



Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, which included outer space, was concluded.

On May 18, 1977, representatives of the Soviet Union and the United States put their signatures in Geneva to an Agreement Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes.

A Treaty on the Prohibition of the Stationing of Weapons of any Kind in Outer Space would have been of principled significance in preventing its militarization. The Soviet Union put forward such a draft at the U.N. in 1981.

Two years later, in 1983, our country suggested taking this idea a further step forward and agreeing to a total ban on the use of military force both in space itself, and from space against targets on earth. The draft of such a document was proposed to the 38th session of the U.N. General Assembly. It combined the political and legal undertakings of states to prevent the use of force against each other in space and from space, as well as the relevant material measures. It was designed to prevent the militarization of outer space. The draft treaty also provided for a complete ban on the testing and deployment in space of any space-based weapons that could be used from space against targets on earth, in the air or in space. At the same time the U.S.S.R. proposed a radical solution to the problem of anti-satellite weapons—renouncing the development of new ones, destroying existing systems and banning the testing and use of piloted spaceships for military purposes.

The Soviet Union simultaneously assumed the unilateral obligation not to be the first to deploy anti-satellite weapons in space as long as other countries, including the U.S., also refrained from doing so.

In 1984 the Soviet Union undertook another important initiative. On its suggestion the question of the use of outer space exclusively for peaceful purposes, for the good of humanity was included on the agenda of the 39th session of the U.N. General Assembly. An absolute majority of the member countries—150—voted for the resolution on preventing an arms race in space. Only one country abstained—the United States.

The 40th, jubilee session of the U.N. General Assembly in 1985 was marked by important Soviet initiatives. The U.S.S.R. put forward the question on international cooperation in the peaceful exploration of outer space in conditions of its non-militarization. The Soviet Union called on all countries and peoples to do everything to prevent an arms race in space and to work jointly on its peaceful exploration and development for the benefit of all humanity.

What specific means does our country envisage to achieve the peaceful utilization of space?

Firstly. Renunciation by states of the production (including research), testing and deployment of offensive space systems —and this implies the non-militarization of space— would create the conditions for peaceful space exploration and joint efforts in this field on a worldwide scale. Mutual understanding and cooperation between states would expand, and effective use would be made of the material and intellectual resources of mankind. Science and technology would receive a new impulse, and truly boundless opportunities and prospects would be opened up for the application of achievements in space to foster the progress of all of mankind, and resolve the global problems that face it. Such a long-term goal as the industrialization of outer space would prove possible: the building of factories and plants in orbit which could produce new materials and industrial goods in a deep vacuum and conditions of weightlessness.

Secondly. Cooperation between countries could develop along the following lines:

1. Basic scientific exploration of outer space, including the Moon and other celestial bodies, with the launching of interplanetary spaceships to this end.

2. The results of space research would find application in biology, medicine, meteorology studies of climate and the environment, as well as in many other fields of human activity.

3. The creation and use of space hardware, including large international orbital stations and various types of piloted spacecraft.

Thirdly. The peaceful development of outer space must take place with the implicit observance of earlier treaties aimed at preventing the militarization of space.

Fourthly. An international space organization could be set up to arrange and implement the joint efforts of the different states.

Fifthly. The Soviet Union suggests convening a representative international conference that would institute such an organization and agree on the basic principles and directions of cooperation.

"Peaceful exploration of outer space, as experience has

shown, can contribute greatly to further progress and improvement of life on Earth," the Soviet proposal notes. "The Soviet Union is convinced that space—the common property of mankind—should be placed at the service not of war, but of peace and security, the economic and social progress of all nations. The road to this goal lies through joint collective efforts by all the states on our planet."

The Soviet Union's principled and consistent policy of seeking the peaceful use of outer space is an expression of our country's foreign policy of peace. The aim of the Soviet talks with the United States in Geneva is to block the path of weapons to space and get down to a radical reduction in nuclear weapons on earth. The talks are difficult, but they are of immense significance for the future of mankind.

The Conference participants resolutely declare for preventing the deployment of arms in outer space, for a strict observance of the ABM treaty, for an agreement banning anti-satellite systems and space-to-earth weapons, and blocking the spread of the arms race to space. They demand that space be used exclusively for peaceful purposes, along rational lines, for the benefit of all mankind.

From the Communiqué of the Conference of the Political Consultative Committee of the Warsaw Treaty member states May 28-29, 1987

The summit meeting in Reykjavik in the autumn of 1986 gave a new impetus to these talks. In the Icelandic capital the Soviet Union proposed, as one of the most important steps in the reduction and elimination of nuclear weapons, strengthening the ABM treaty, so as to ensure that the two sides should undertake not to use their right to withdraw from the treaty for ten years, i.e., exactly the period during which both the U.S.S.R. and the U.S. would be reducing and ultimately abolishing their nuclear arsenals. Taking into account Washington's stand on SDI, Moscow did not insist on all work on this programme being stopped. But it stressed that for ten years all the provisions of the treaty should be implicitly abided by, with only research and tests in laboratory conditions being permitted. This restriction applied to both the U.S.S.R. and the U.S. In making this proposal, the Soviet Union was guided by the fact that by consenting to the continuation of laboratory research and testing, it would allow the President to bring his idea to its conclusion and find out what SDI really was.

The American side, however, for its part, immediately started insisting on the right to research and test all that concerns SDI not only in laboratories, but outside them as well, including, of course, in outer space.

Directly after Reykjavik, the United States began to depart even from what had been agreed there. It began to talk of an undertaking not to withdraw from the ABM treaty for 7, not 10, years. Its excuse was that SDI research did not pose a threat to violate the provisions of that important document.

The Soviet Union again displayed patience, flexibility and readiness to seek a way out so as not to torpedo the negotiations on nuclear disarmament. In mid-April Mikhail Gorbachev had a meeting with American Secretary of State George Shultz in Moscow. It was then for the first time explained to the envoy from Washington what was to be understood by restricted laboratory conditions. Namely scientific-research work on Earth—in institutes, at proving grounds and in factories. It was left to the experts of both countries to consider and agree on the list of devices which in the course of this research would be banned from being taken into space. The Soviet Union believes that it is in that direction that a way out lies.

Speaking in mid-May to representatives of work collectives at the Baikonur cosmodrome and in the town of Leninsk, Mikhail Gorbachev said: "American ruling circles are making frantic efforts to put obstacles in the way of the progress that is being made in the search for accords. The present moment in the development of the world situation is an important one. We must act dynamically and thoughtfully; we will do everything necessary to achieve real progress. Here our interests also coincide with those of the Americans and all other peoples. They do not coincide with the interests of those who are making money out of the arms race and want to achieve military superiority via outer space."

The Soviet Union will not be the first to take weapons into outer space. It will continue to try and convince all countries, and particularly the United States, not to take the fateful step that would inevitably increase the threat of nuclear war and give an impetus to an uncontrolled arms race in all directions.

The photographs, charts and diagrams used in this supplement have been taken from Der Spiegel and Stern (F.R.G.), L'Espresso (Italy), U.S. News and World Report and Time (U.S.A.), PHP Intersect (Japan), Die Welt and Vorwärts (F.R.G.), Dagens Nyheter (Sweden), the book "Star Wars. Delusions and Dangers," and a booklet put out by the Novosti Press Agency (U.S.S.R.). A poster issued by the Soviet Peace Committee has also been used.

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